VISION

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US Army Aberdeen Test Center

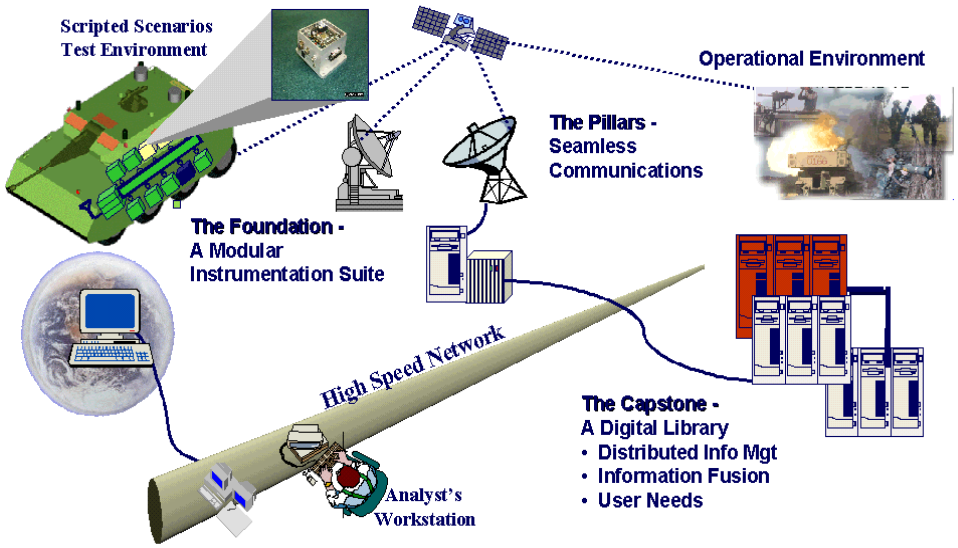
http://vision.atc.army.mil

VISION

Versatile Information Systems Integrated On-line

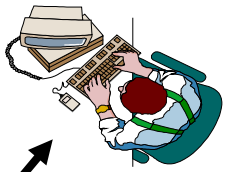
VISION embodies a comprehensive, holistic, top down approach to information collection, management, and ultimate transformation into knowledge.

- **Modular Instrumentation Suite** – a family of intelligent instruments configure as an on-vehicle Local Area Network
- **Seamless Communications** – wireless Ethernet based on IEEE-802.11 standards
- **Digital Library** – knowledge management web-based system for information fusion



VISION employs a web-centric approach that merges and exploits instrumentation and information management technologies

Concept of Operation



ILH

Informati

on

'Below the line' metadata
Configuration/Control

Project metadata

TEML (XML) Configuration File

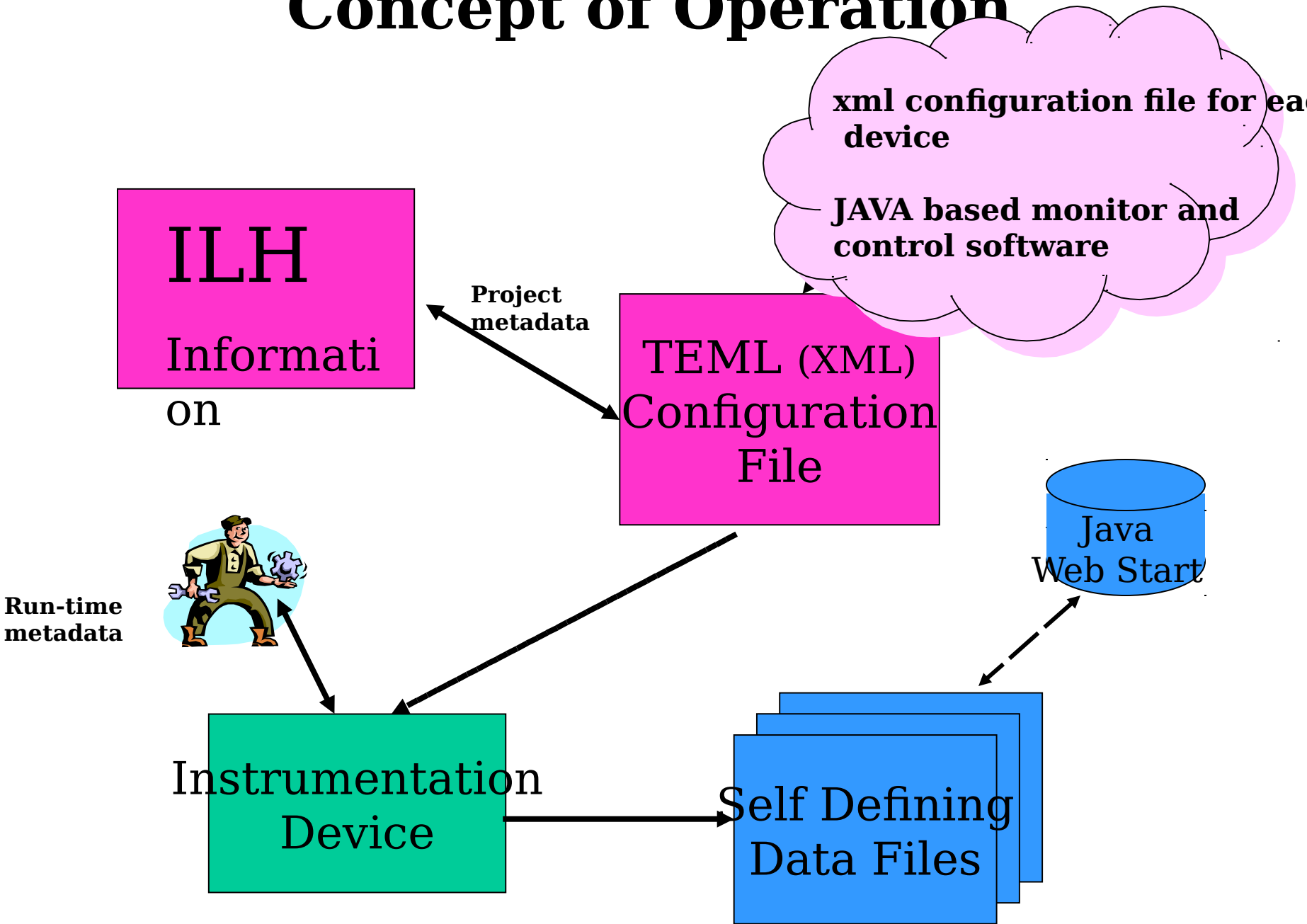
Java Web Start

Run-time metadata

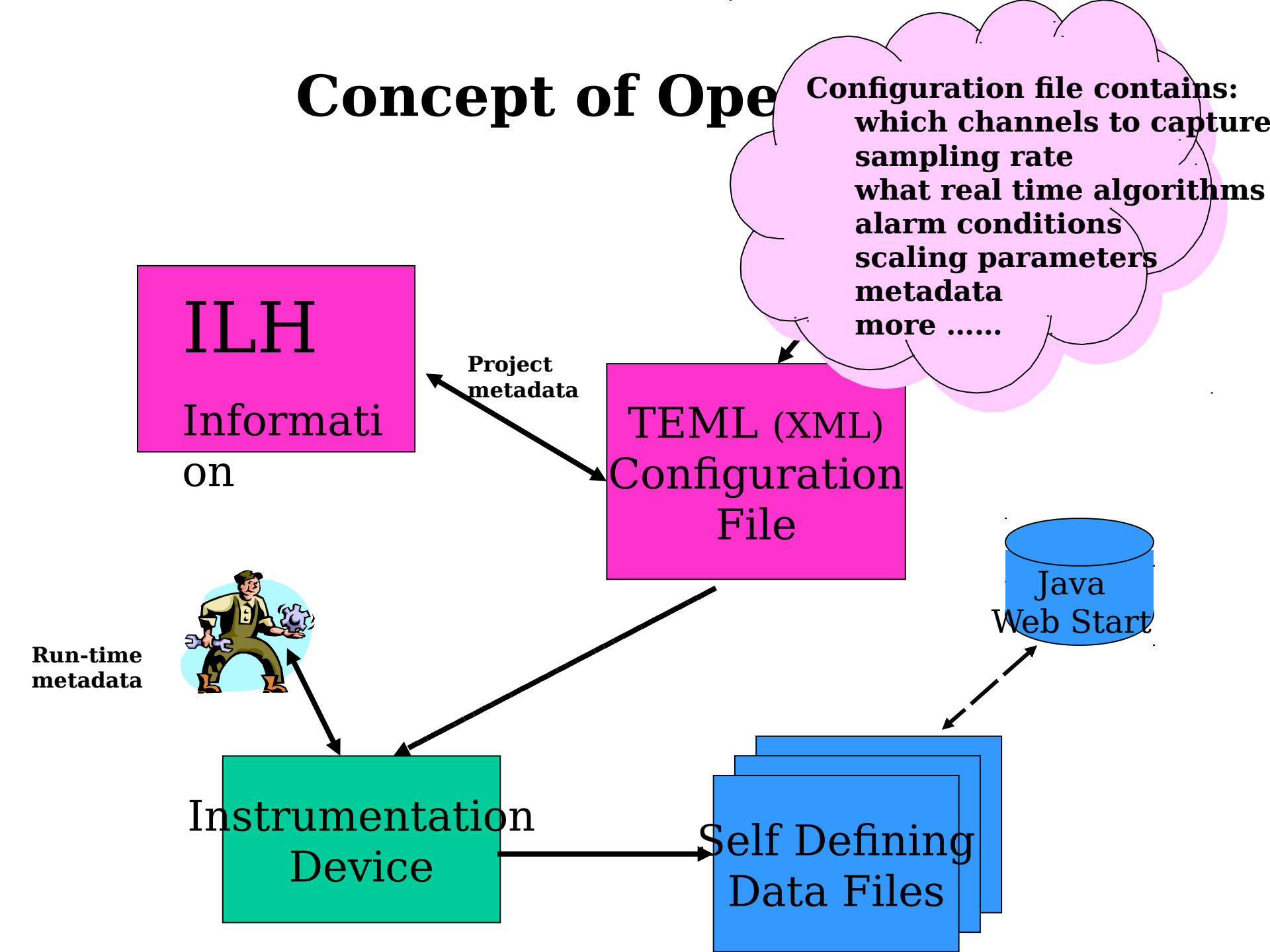
Instrumentation Device

Self Defining Data Files

Concept of Operation



Concept of Ope



VISION
Instrumentation

Operational Environment

- **Object oriented design**
- **Scaleable**
- **Remote display and control**
- **Long term compressed data storage**
- **Flexible data transfer - fast data access**
- **Information technology fully integrated**

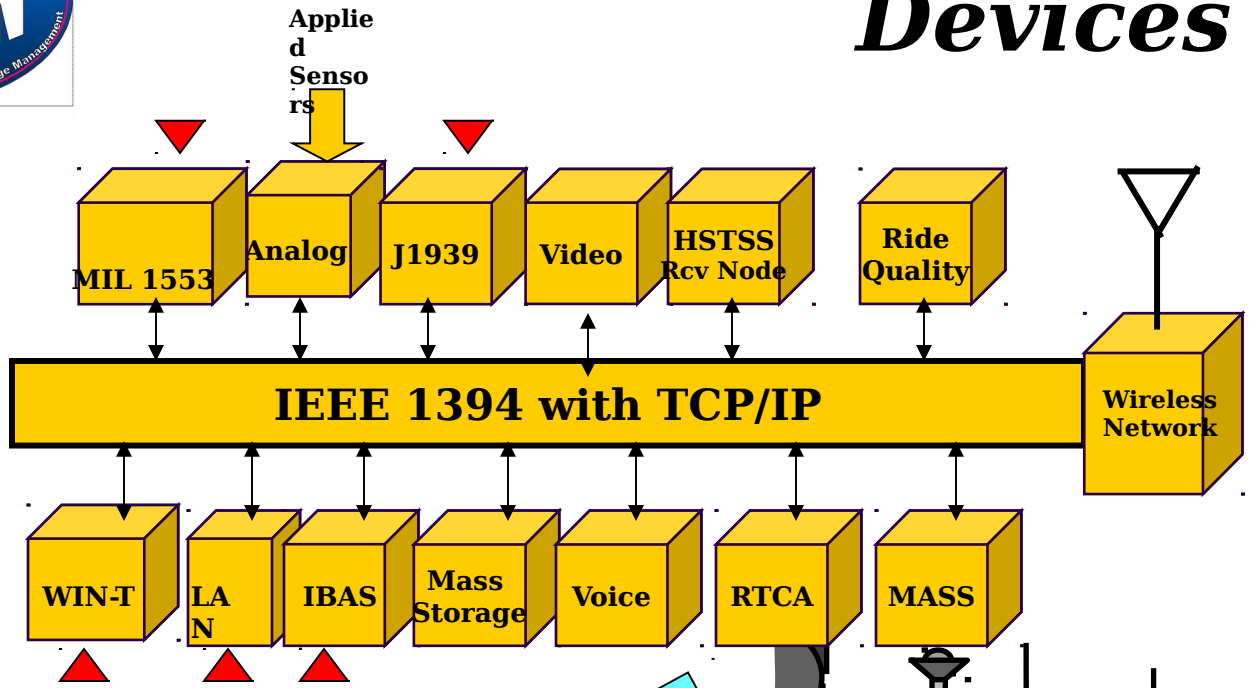
Internet

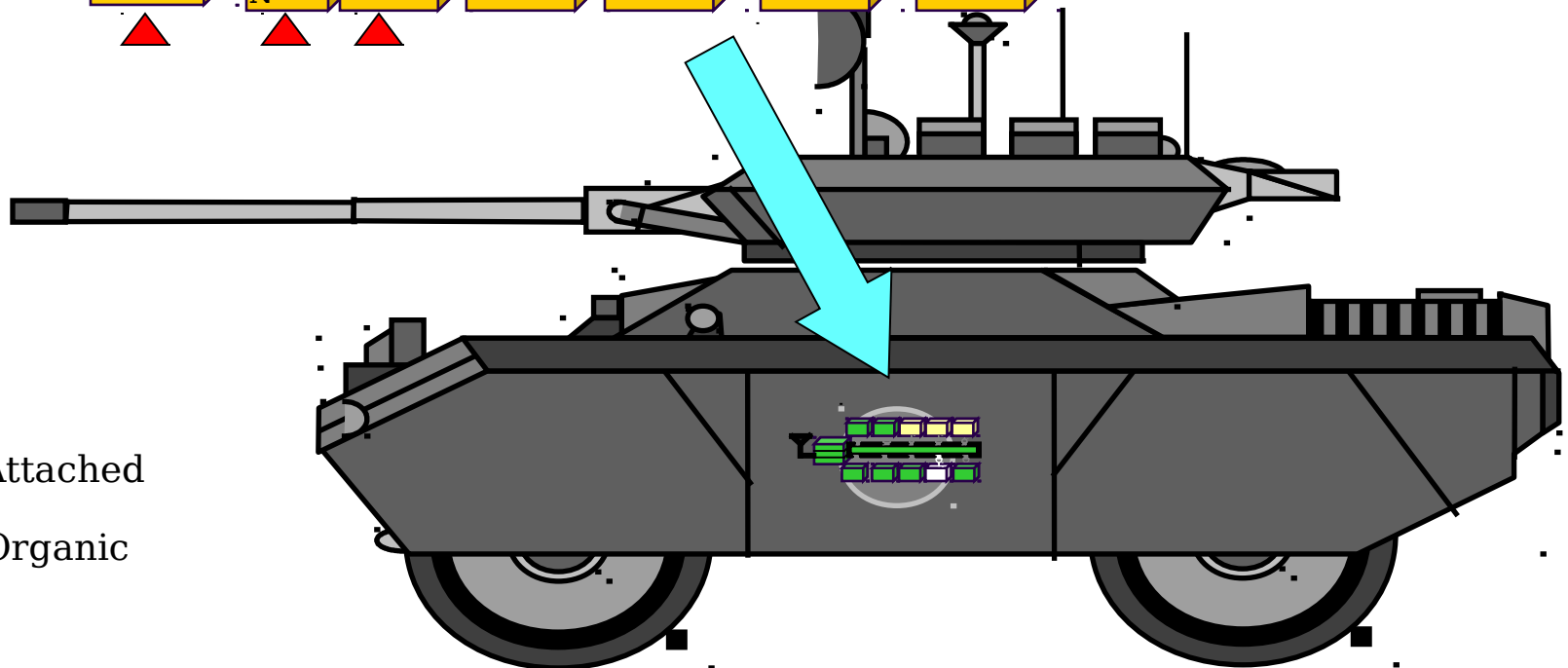
High Speed Network

Analyst's Workstation

Integrated Information Systems

Instrumentation *Devices*





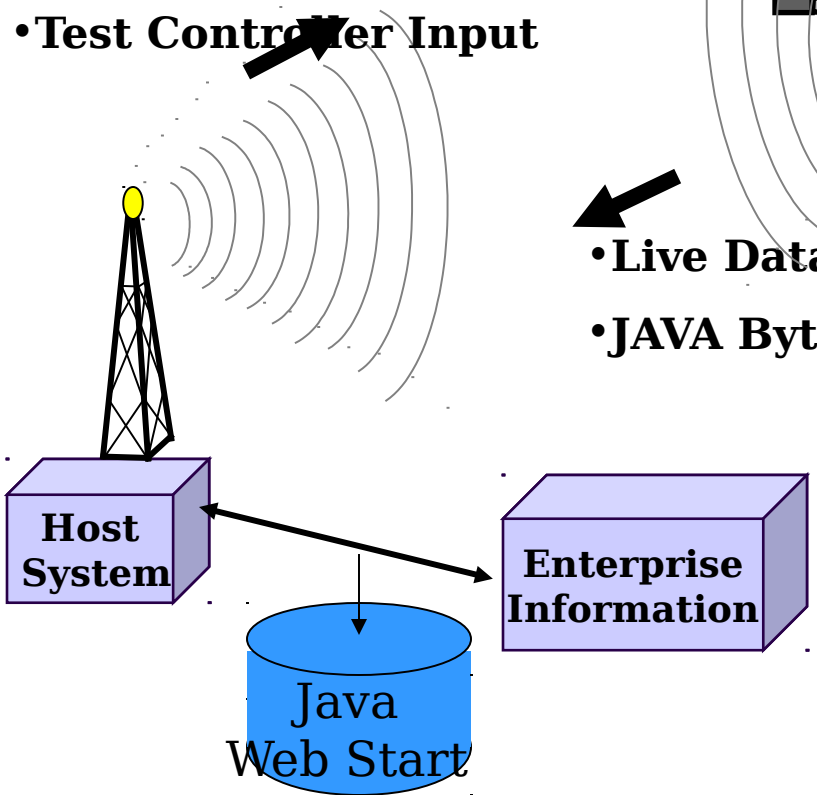
Attached

Organic

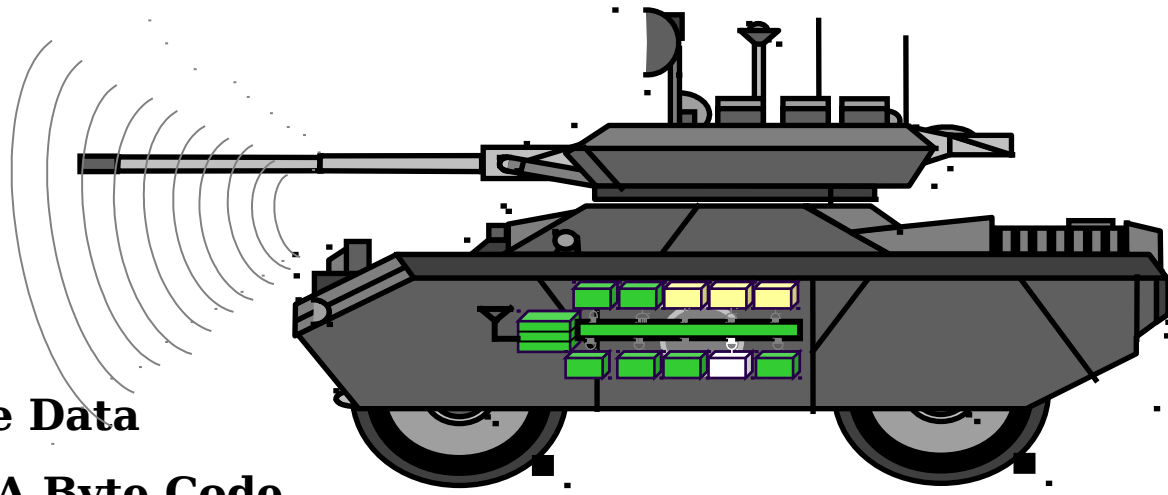
Instrumentation *Devices*

ADVANCED DISTRIBUTED MODULAR ACQUISITION SYSTEM (ADMAS)

- **Configuration & MetaData**
- **Test Controller Input**



- **Live Data**
- **JAVA Byte Code**



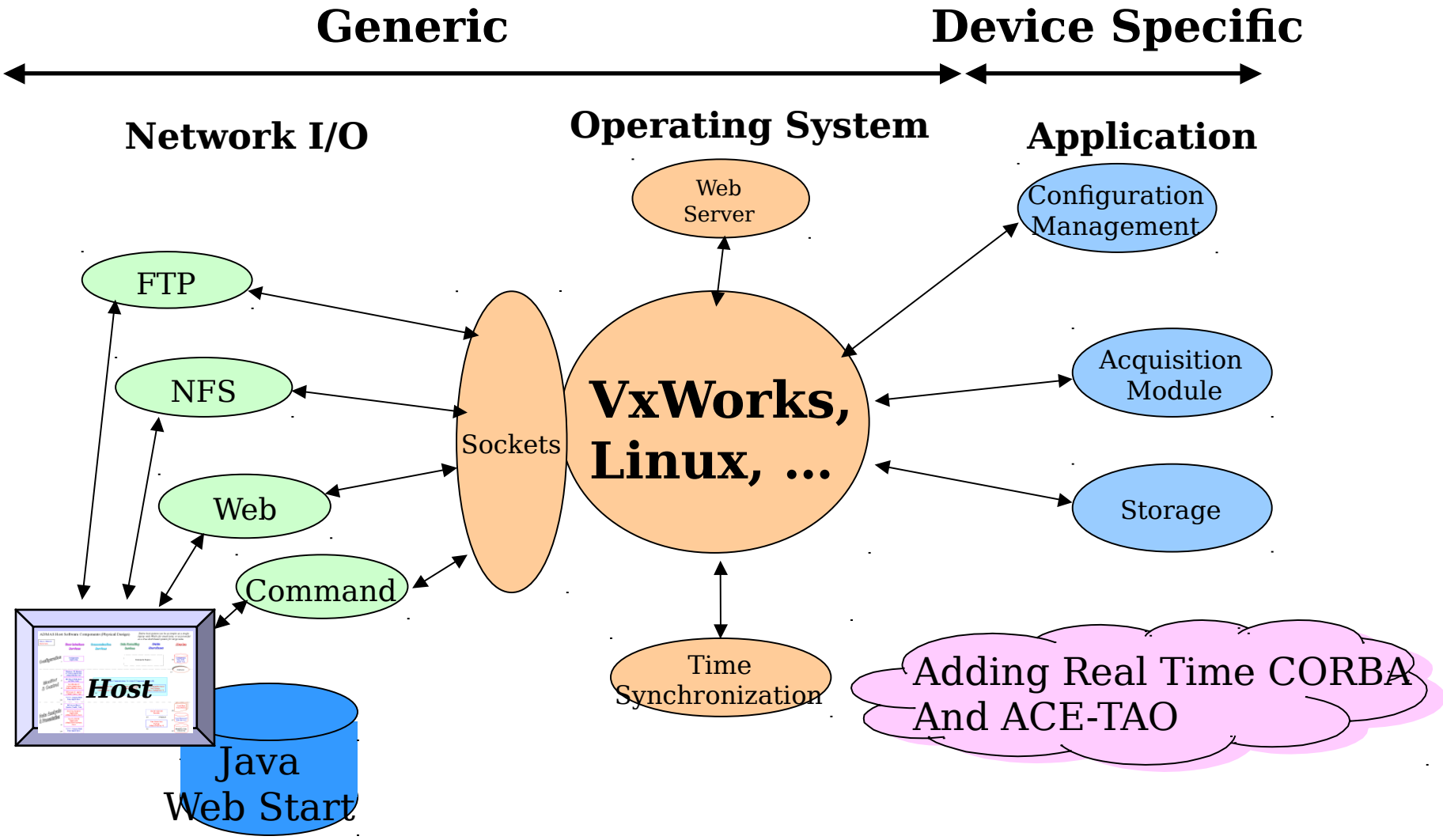
Distributed Memory

- **Object oriented design**
- **Scaleable**
- **Remote display and control**
- **Long term compressed data storage**
- **Flexible data transfer - fast data access**

ADMAS Analog

- **32 Analog Channels**
  - **16 Bit Digitizer**
  - **200K samples/sec**
- **2 Counter Timer**
- **Up to 1.7 Gbytes removable solid state storage**
- **233 MHz Pentium Class Processor**
- **128 Mbytes Memory**
- **Attached/Controlled Signal Conditioner**

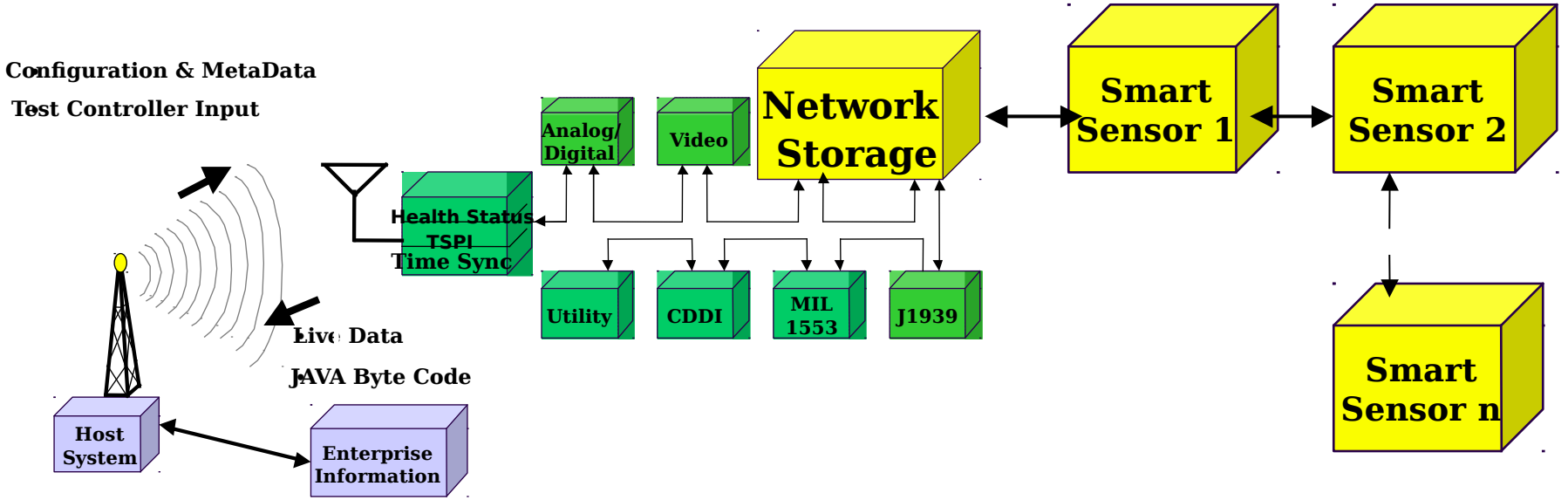
ADMAS Logical Architectur



VISION Instrumentation Deployment

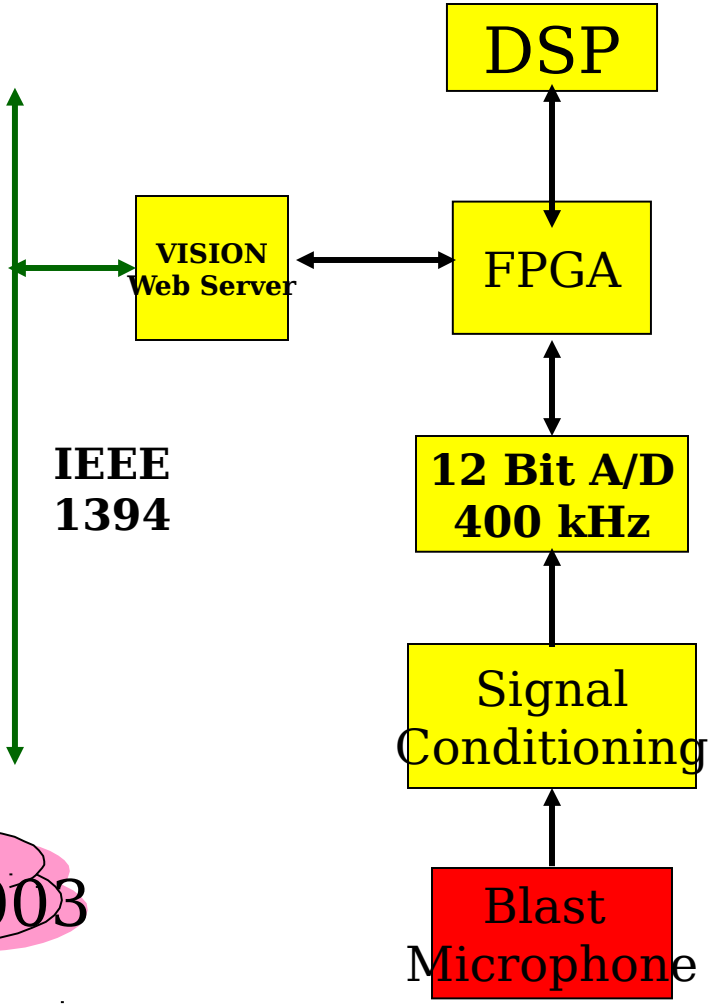
- **AAAV**
  - **GPS position and time**
  - **SAE J-1939**
  - **Utility Bus**
  - **CDDI**
- **Stryker**
  - **GPS position and time**
  - **Analog**
  - **SAE J-1708**
  - **MIL 1553**
- **M1A2**
  - **MIL 1553**
- **FMTV**
  - **Analog**
  - **SAE J-1939**
- **IVI**
  - **21st Century VPR**
- **CASCOM CEP**
  - **Variant for instrumenting Bradley, PLS, HMMWV**
- **TMDE**
  - **Variant for embedded diagnostics**

Smart Sensors Enhancement



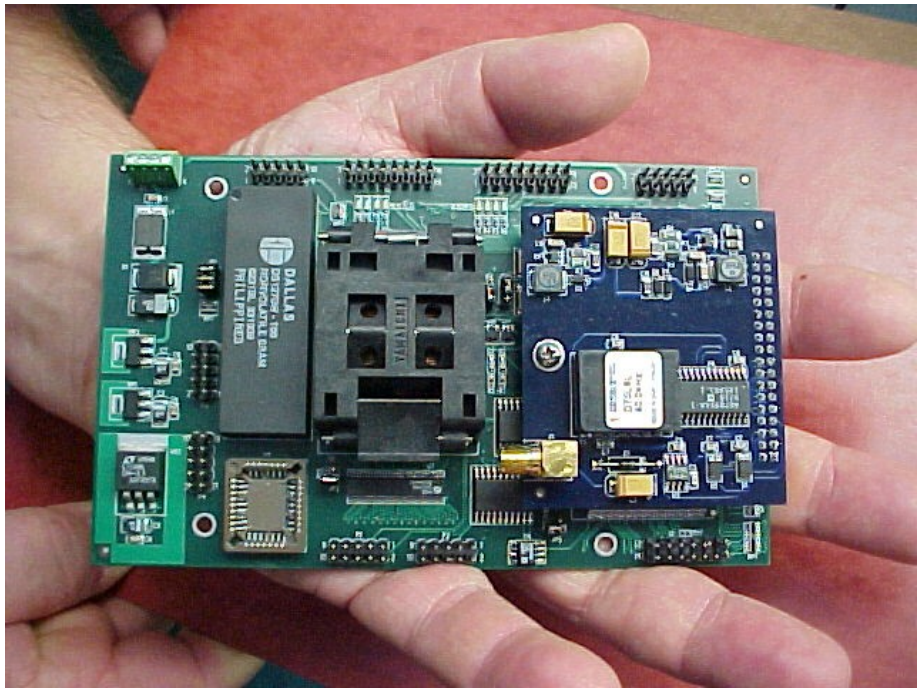
Blast Overpressure Smart Sensor

- VISION Compliant Interface for Sensor Status/Control
- 250 ms Transient Capture Capability (50 ms pre/200 ms post about detected peak)
- Algorithms
  - Peak Overpressure Capture/Display
  - Pulse duration
  - Damage potential
- 40 KHz, 6 Pole Bessel Anti-Alias Filter
- 400 KHz, 12 Bit A/D

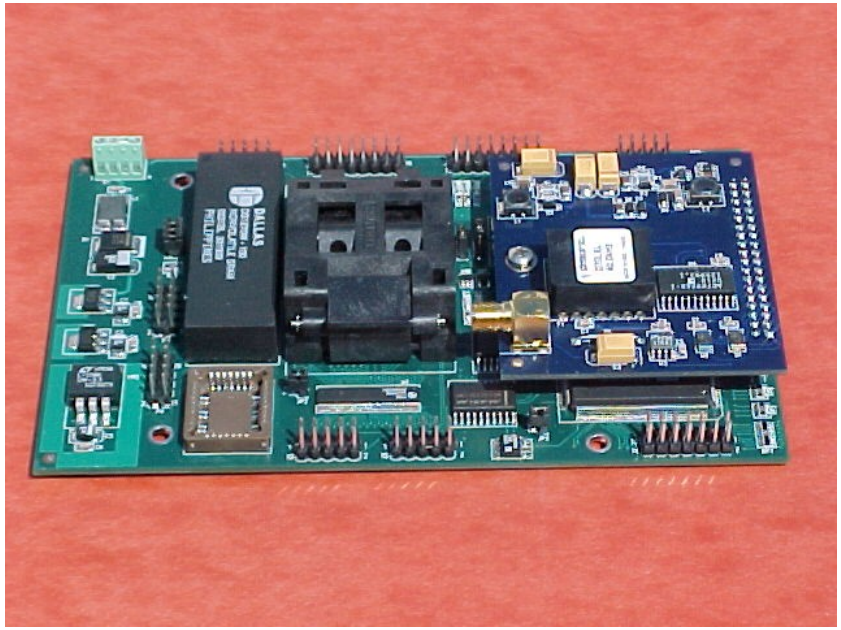


Field test in August 2003

Blast Overpressure Smart Sensor

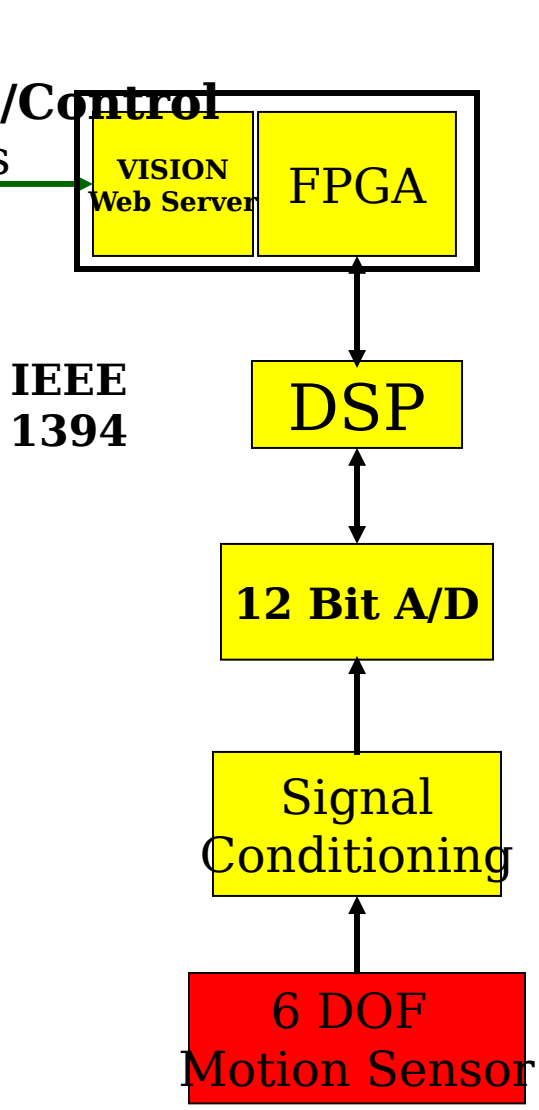


When socketed devices are replaced with surface mount, Size will decrease ~ 50%

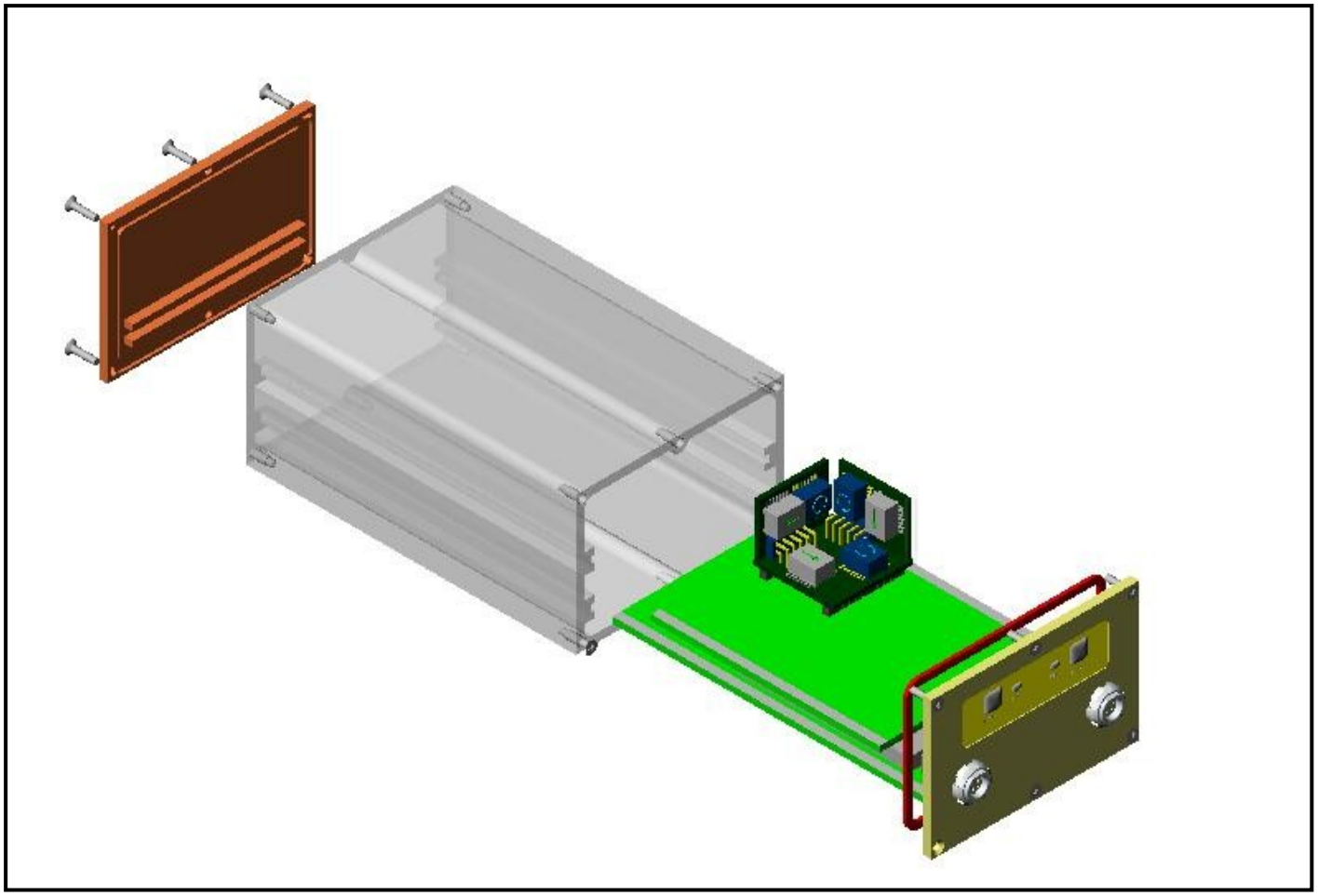


Motion Analysis Smart Sensor

- **VISION Compliant Interface for Sensor Status/Control**
  - Accepts Control Commands and Reports Status
  - Status and statistics via IEEE 1394
- **Three (3) Axis Rate Sensing (°/s)**
  - 1000 sps per channel
  - Maximum Rate ±60°/s
  - Accuracy ±1°/s
- **Three (3) Axis Acceleration Sensing (g)**
  - 1000 sps per channel
  - Accuracy ±0.05 g
  - Maximum Acceleration ±10 g

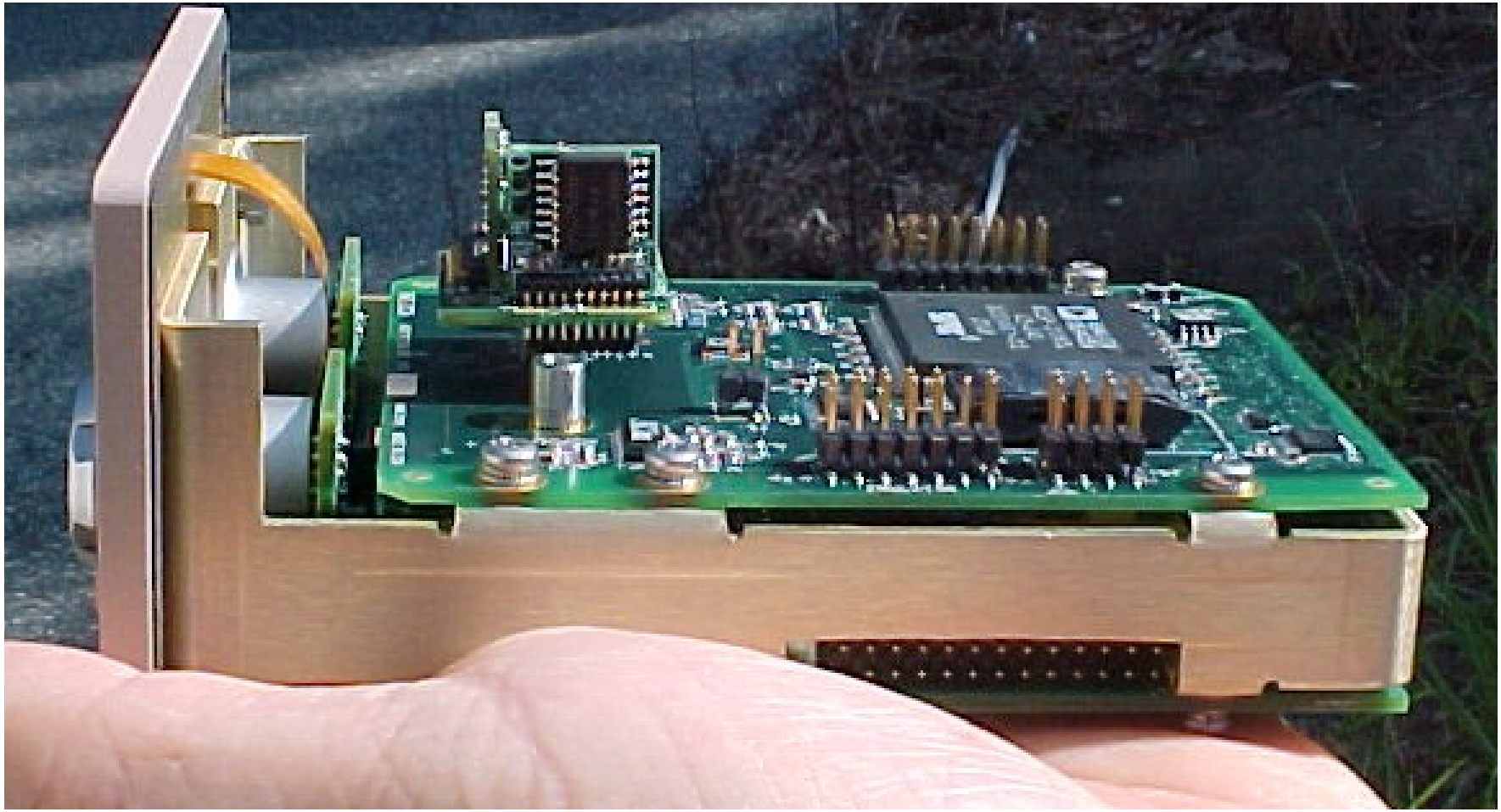


Motion Analysis Smart Sensor

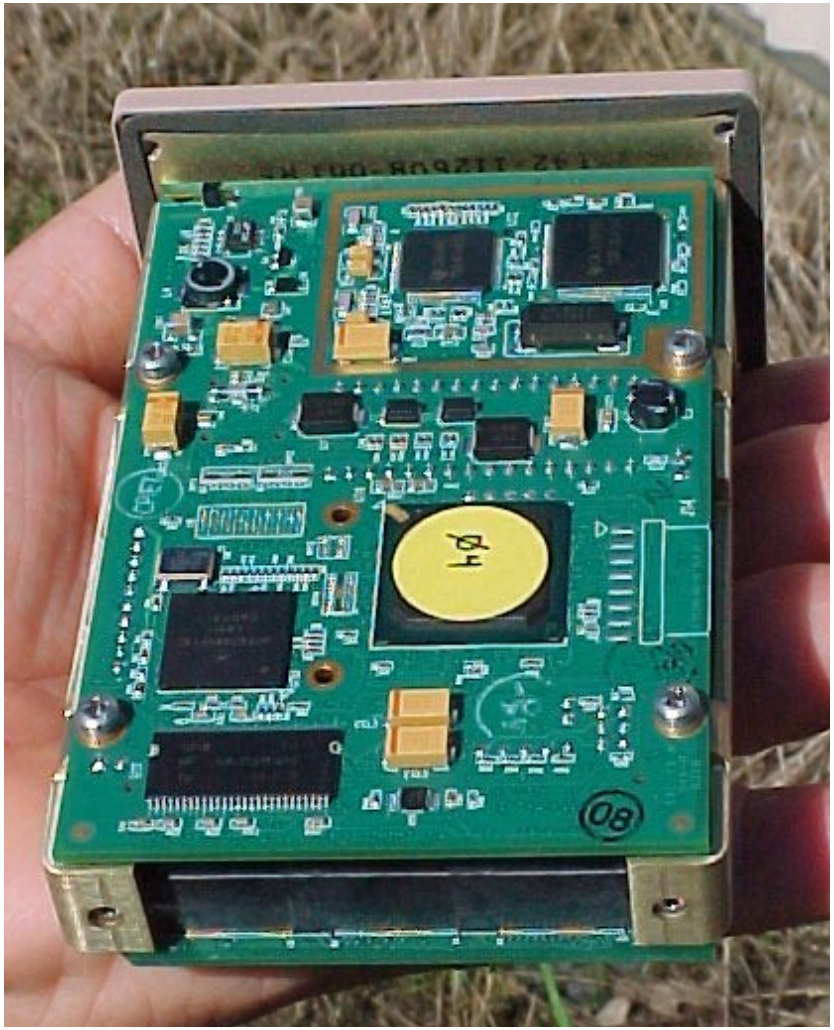


Motion Analysis Smart Sensor

Motion Analysis Smart Sensor



Motion Analysis Smart Sensor

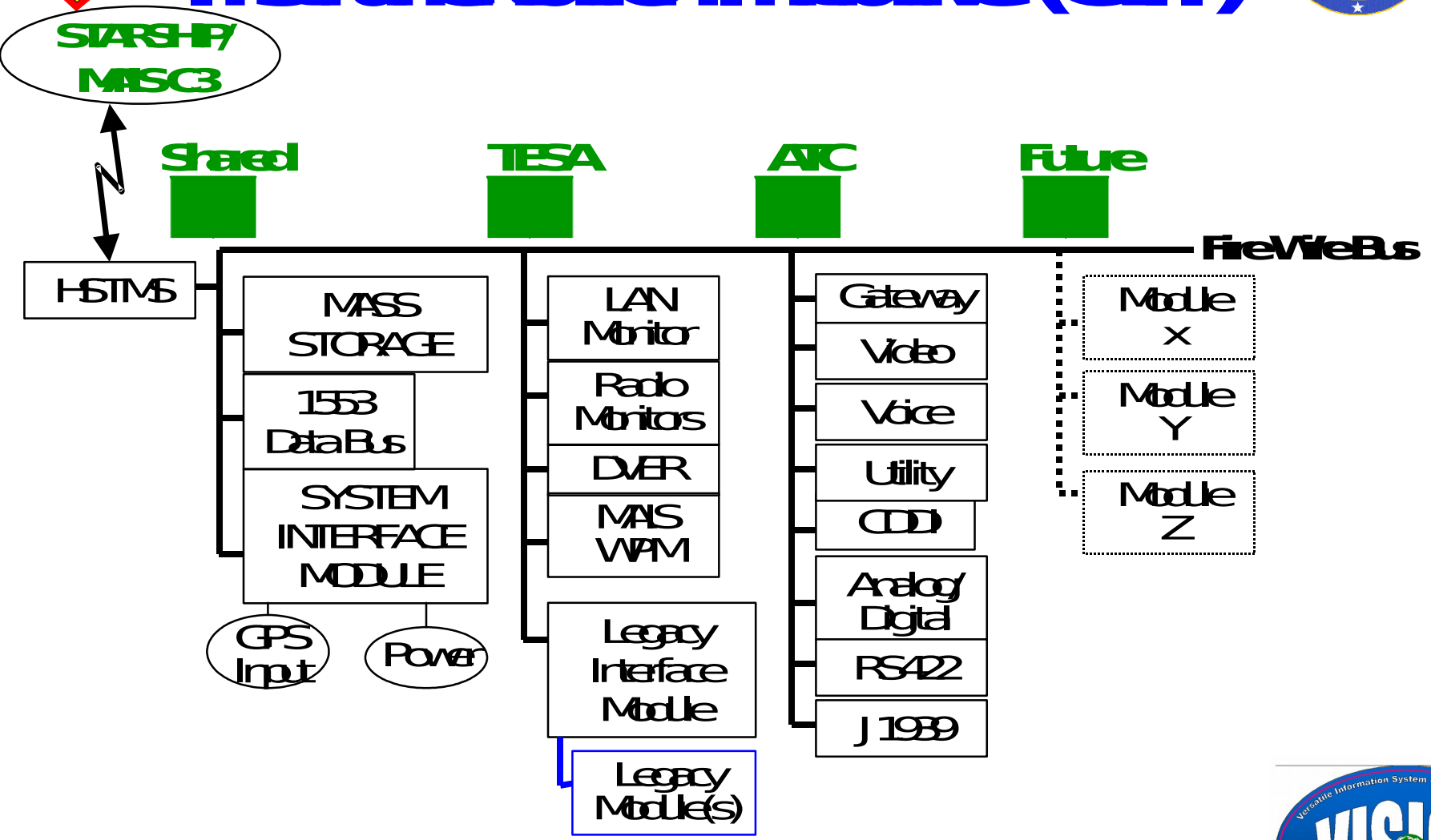


Common Vehicular Instrumentation Initiative (CVII)

CVII is a cooperative effort between the Aberdeen Test Center (ATC) and the Operational Test Command (OTC). CVII is defining the communication infrastructure for modular instrumentation used by the U.S. Army for test and training exercises. The specification includes hardware, protocol / services, and application level interface specifications that are based on a common object model.

CVII will provide a basis for development of diverse modules which may be used or "tailored" to the instrumentation requirements of the system under test without the expense of an entirely new instrumentation suite.

Common Vehicular Instrumentation Initiative (CVII)

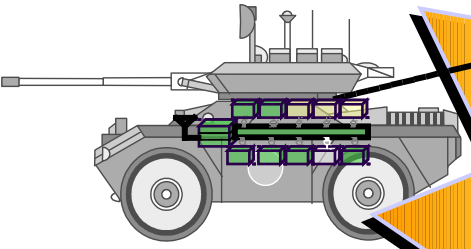


CVII Player Unit Compliance Highlights

- **Level 1**
- A PU Device has a IEEE-1394 Interface
- Uses specified CVII Cables and connectors
- **Level 2**
- A device can plug into the IEEE-1394 Bus and communicate with other CVII devices via Asynchronous and /or Isochronous connections
- **Level 3**
- IP over IEEE-1394
- TCP
- FTP
- **Level 4**
- CVII Devices make use of DHCP
- **Level 5**
- Basic CORBA services are used by CVII Devices
- **Level 6**
- CORBA: Naming Service are used by CVII Device
- CORBA: Audio and Video Device Control Services are used by CVII Devices
- CORBA: SBP-2 Device Control Services are used by CVII Devices

VISION
Communication

Scripted Scenarios
Test Environment



Operational Environment

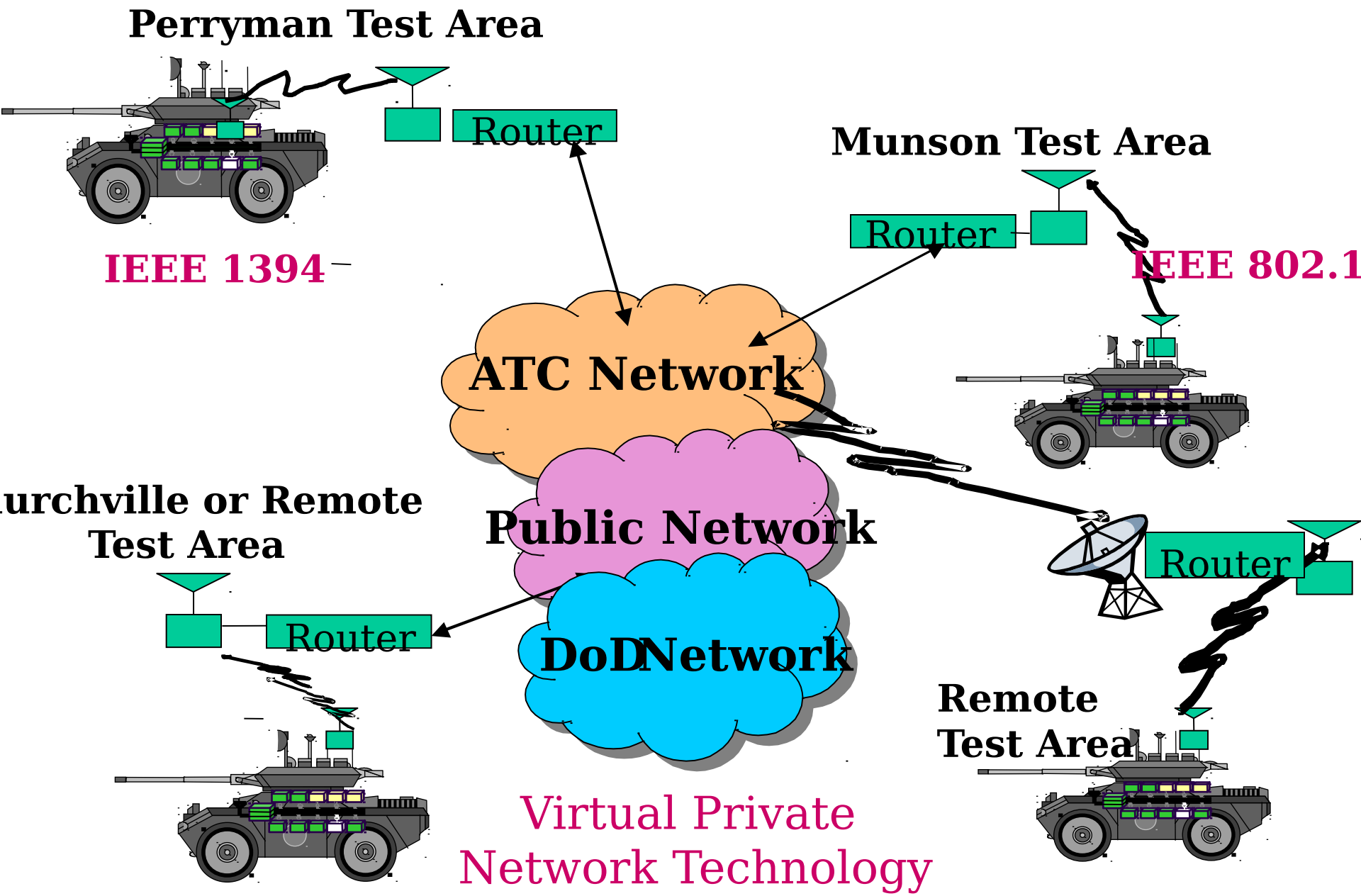
Internet

High Speed
Network

Analyst's
Workstation

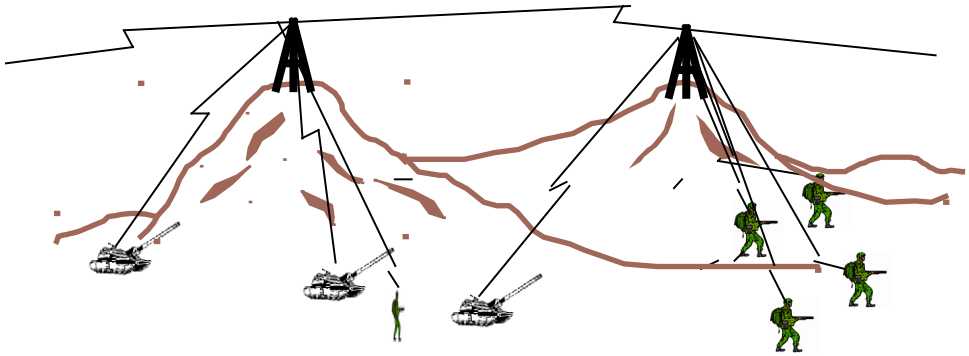
- **Information conduit to and from military system**
- **Makes use of satellite, cellular phone technology, local RF, military networks**
- **"Wire Neutral"**

VISION Mobile Networking

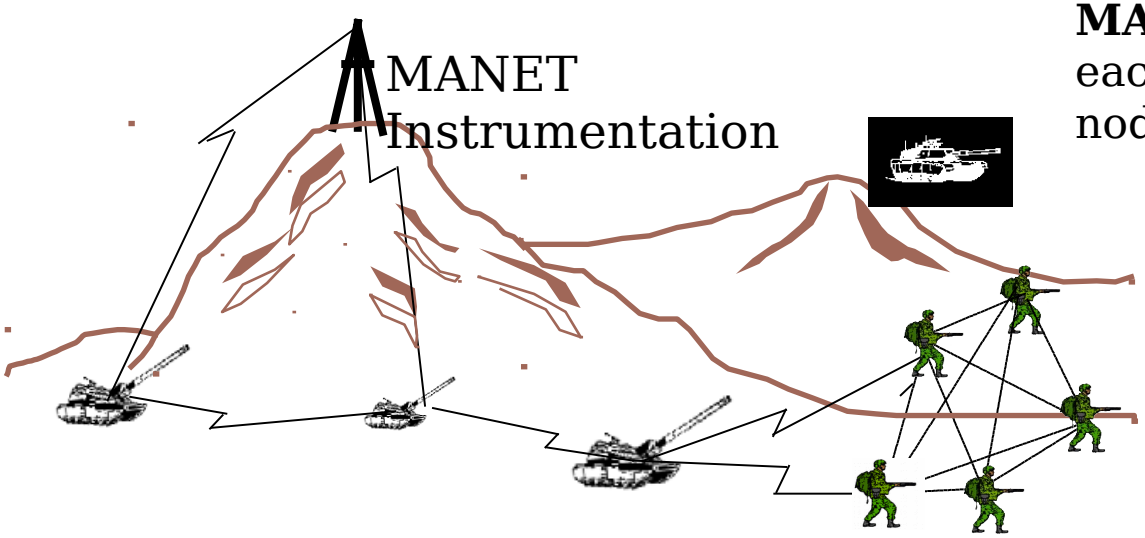


Traditional vs. MANET Based Instrumentation Systems

Traditional Instrumentation



Traditional Communications - each node must transmit and receive from an infrastructure node



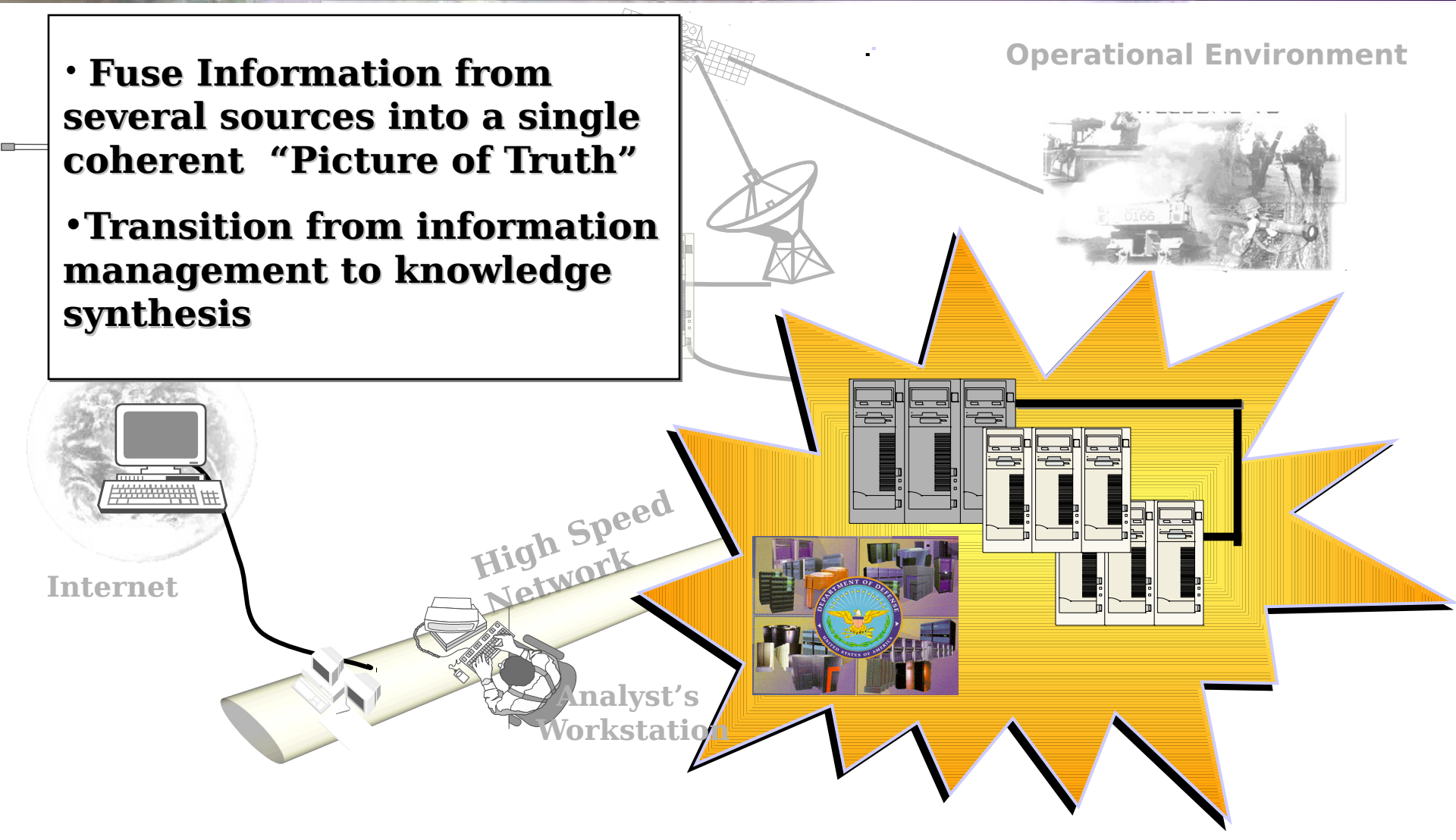
MANET communications - each node is a repeater or router

- No infrastructure
- Greater spectral efficiency
- Nodes can communicate directly w/o using tower. Can use towers, if available.
- MANET, w/power-aware networking, dynamically adjusts power to meet

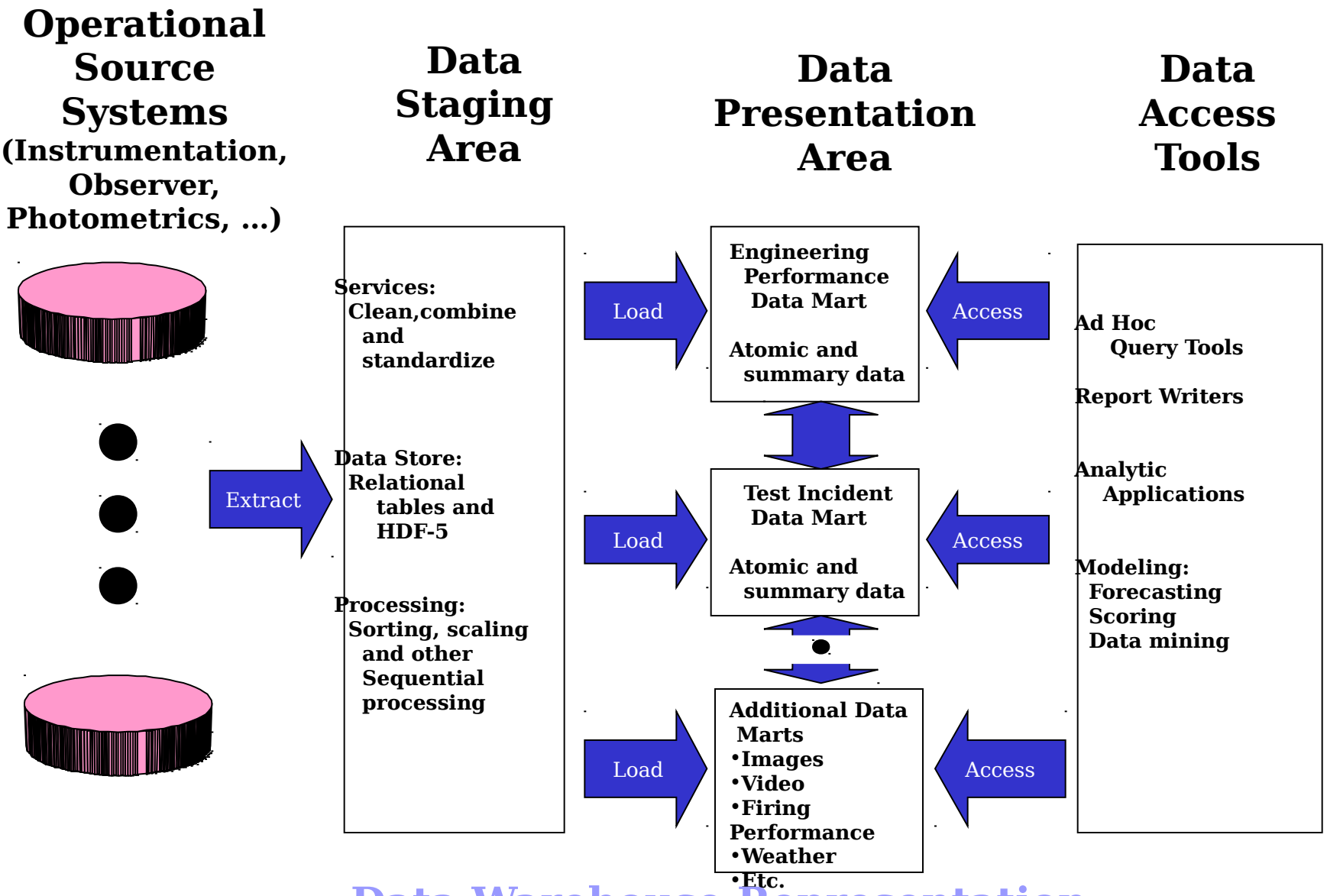
VISION

Knowledge Management System

- **Fuse Information from several sources into a single coherent "Picture of Truth"**
- **Transition from information management to knowledge synthesis**

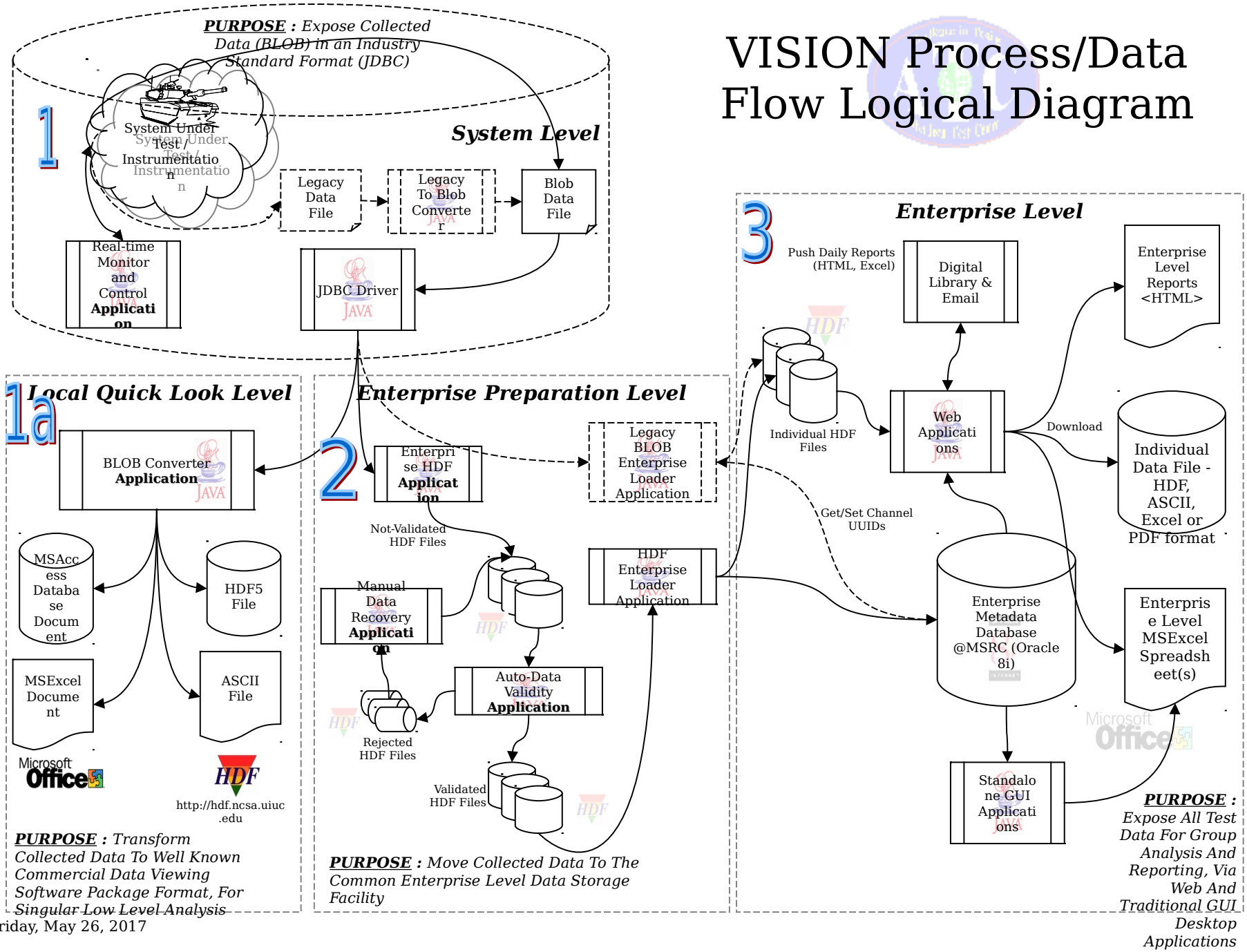


VISION Data Management

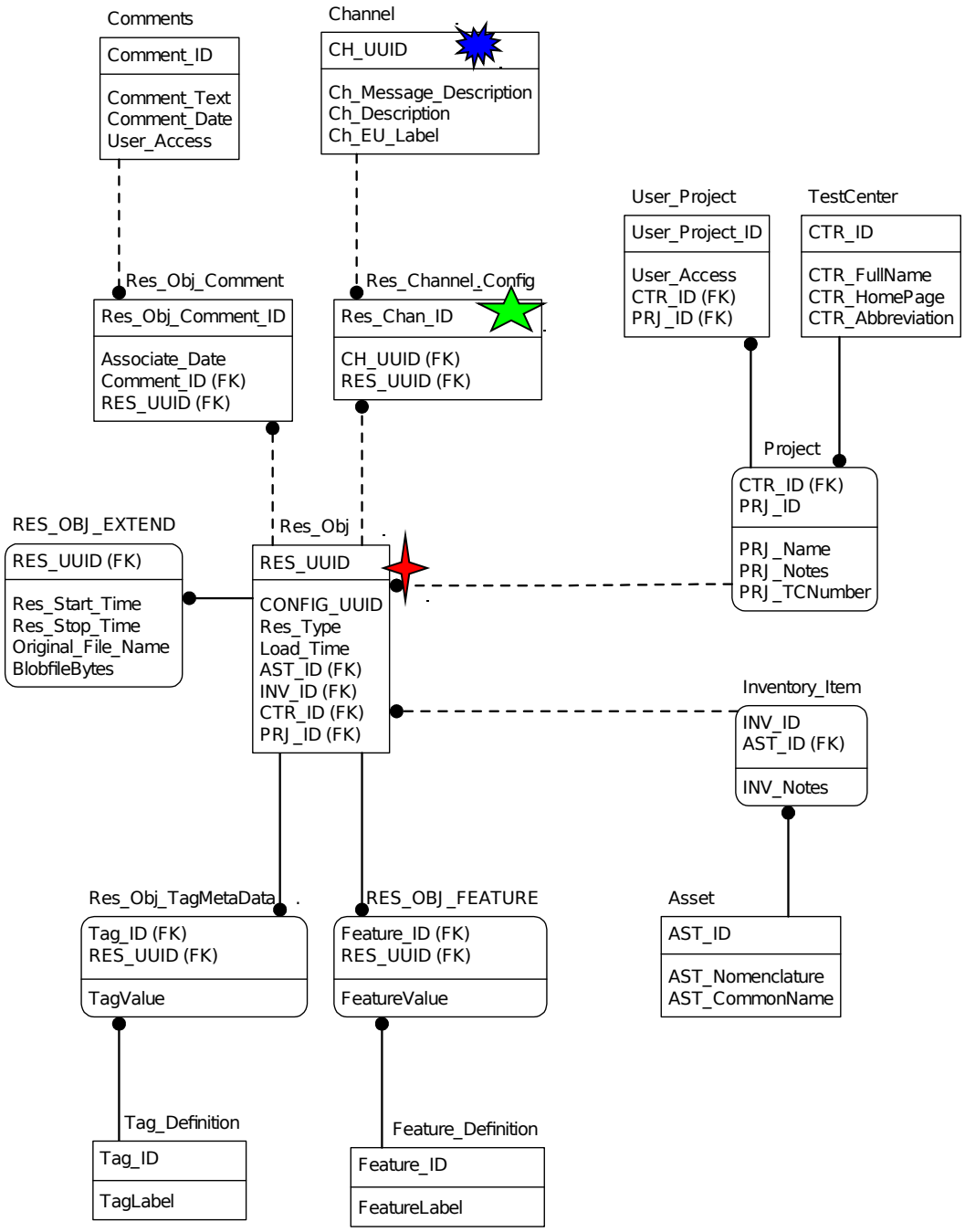


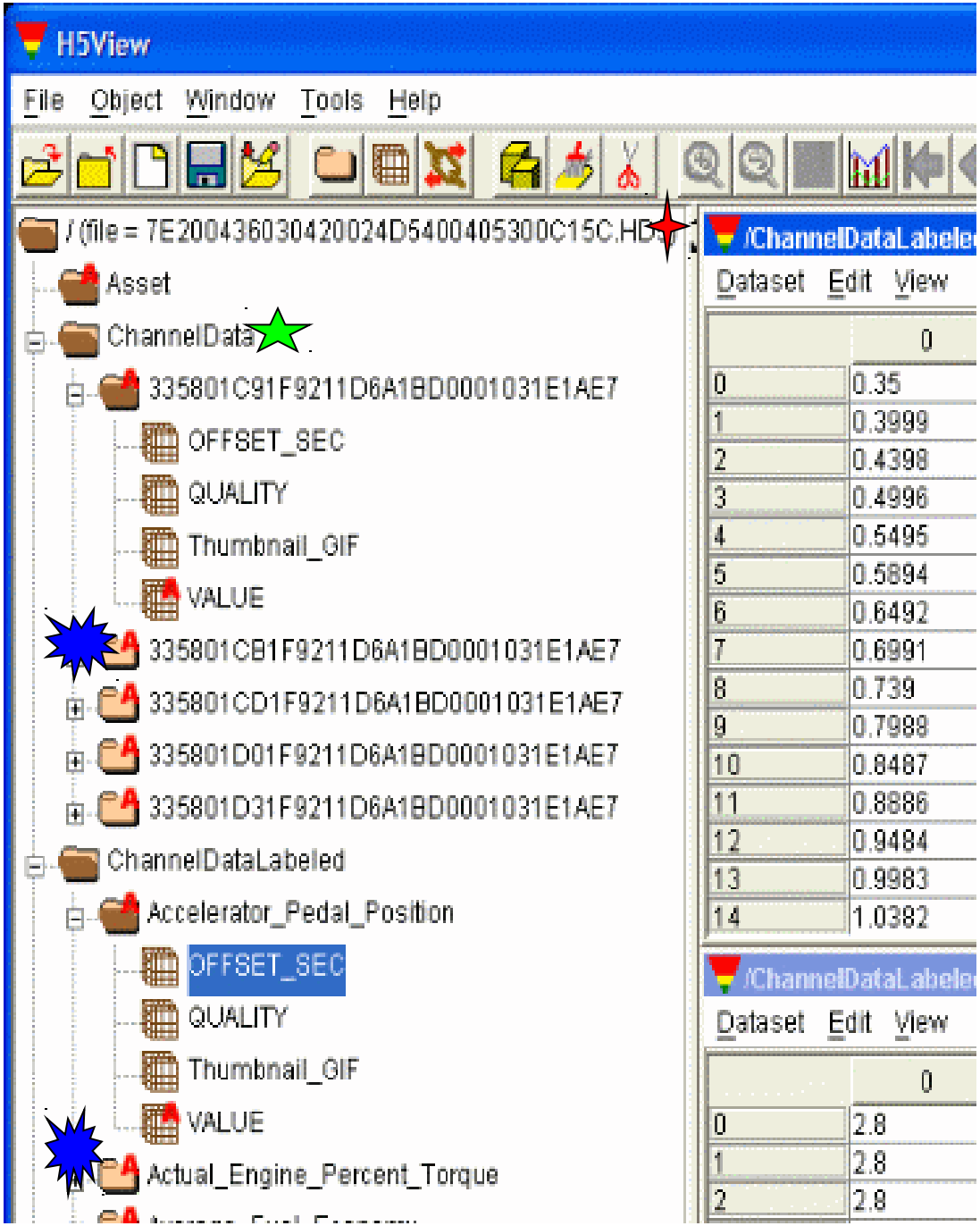
Data Warehouse Representation

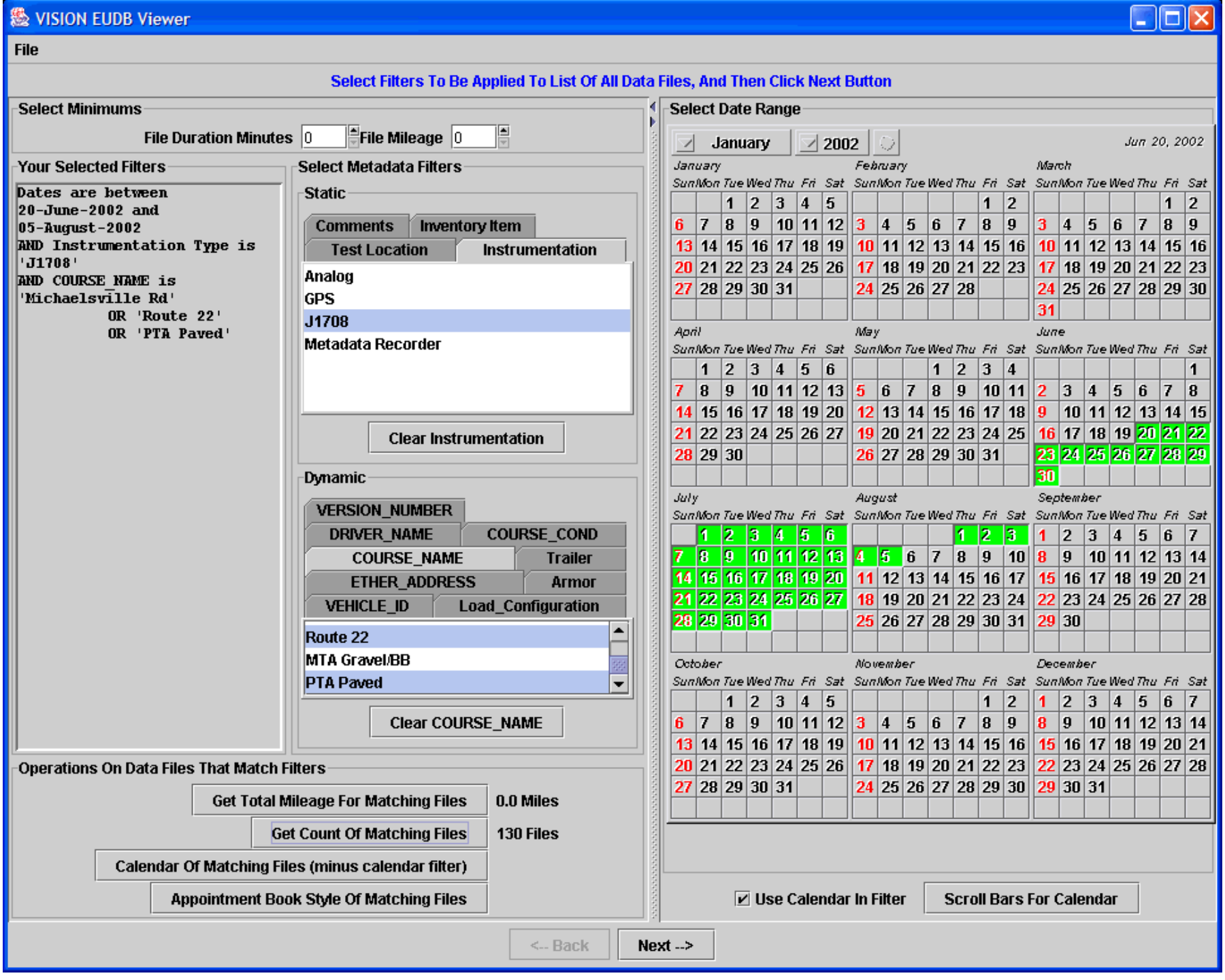
VISION Process/Data Flow Logical Diagram


PURPOSE : Expose Collected Data (BLOB) in an Industry Standard Format (JDBC)
System Level
1
System Under Test / Instrumentation
Legacy Data File
Legacy To Blob Converter
Blob Data File
Real-time Monitor and Control Application
JDBC Driver
Local Quick Look Level
1a
BLOB Converter Application
MSAccess Database Document
HDF5 File
MSExcel Document
ASCII File
Microsoft Office
HDF
http://hdf.ncsa.uiuc.edu
PURPOSE : Transform Collected Data To Well Known Commercial Data Viewing Software Package Format, For Singular Low Level Analysis
Enterprise Preparation Level
2
Enterprise HDF Application
Legacy BLOB Enterprise Loader Application
Not-Validated HDF Files
Manual Data Recovery Application
HDF Enterprise Loader Application
Auto-Data Validity Application
Rejected HDF Files
Validated HDF Files
PURPOSE : Move Collected Data To The Common Enterprise Level Data Storage Facility
Enterprise Level
3
Push Daily Reports (HTML, Excel)
Digital Library & Email
Enterprise Level Reports <HTML>
Individual HDF Files
Web Applications
Download
Individual Data File - HDF, ASCII, Excel or PDF format
Get/Set Channel UUIDs
Enterprise Metadata Database @MSRC (Oracle 8i)
Enterprise Level MSExcel Spreadsheet(s)
Standalone GUI Applications
PURPOSE : Expose All Test Data For Group Analysis And Reporting, Via Web And Traditional GUI Desktop Applications

VISION Enterprise Database Schema




H5View
File Object Window Tools Help
/ (file = 7E20043603042002 4D5400405300C15C.HDF)
Asset
ChannelData
335801C91F9211D6A1BD0001031E1AE7
OFFSET_SEC
QUALITY
Thumbnail_GIF
VALUE
335801CB1F9211D6A1BD0001031E1AE7
335801CD1F9211D6A1BD0001031E1AE7
335801D01F9211D6A1BD0001031E1AE7
335801D31F9211D6A1BD0001031E1AE7
ChannelDataLabeled
Accelerator_Pedal_Position
OFFSET_SEC
QUALITY
Thumbnail_GIF
VALUE
Actual_Engine_Percent_Torque
/ChannelDataLabele
Dataset Edit View
0
0 0.35
1 0.3999
2 0.4398
3 0.4996
4 0.5495
5 0.5894
6 0.6492
7 0.6991
8 0.739
9 0.7988
10 0.8487
11 0.8886
12 0.9484
13 0.9983
14 1.0382
/ChannelDataLabele
Dataset Edit View
0
0 2.8
1 2.8
2 2.8


VISION EUDB Viewer
File
Select Filters To Be Applied To List Of All Data Files, And Then Click Next Button
Select Minimums
File Duration Minutes 0
File Mileage 0
Your Selected Filters
Dates are between
20-June-2002 and
05-August-2002
AND Instrumentation Type is
'J1708'
AND COURSE_NAME is
'Michaelsville Rd'
OR 'Route 22'
OR 'PTA Paved'
Select Metadata Filters
Static
Comments
Inventory Item
Test Location
Instrumentation
Analog
GPS
J1708
Metadata Recorder
Clear Instrumentation
Dynamic
VERSION_NUMBER
DRIVER_NAME
COURSE_COND
COURSE_NAME
Trailer
ETHER_ADDRESS
Armor
VEHICLE_ID
Load_Configuration
Route 22
MTA Gravel/BB
PTA Paved
Clear COURSE_NAME
Operations On Data Files That Match Filters
Get Total Mileage For Matching Files
0.0 Miles
Get Count Of Matching Files
130 Files
Calendar Of Matching Files (minus calendar filter)
Appointment Book Style Of Matching Files
Select Date Range
January
2002
Jun 20, 2002
Use Calendar In Filter
Scroll Bars For Calendar
<-- Back
Next -->

Working Across 130 Files

Select A Channel To Work With

Total Engine PTO Hours
Retarder Status
Instantaneous Fuel Economy
Vehicle Identification Number
Injection Control Pressure
Total Fuel Consumption
Battery Voltage
Trans Range Selected

Your Selected Filters

Dates are between 20-June-2002 and 05-August-2002
AND Instrumentation Type is 'J1708'
AND COURSE_NAME is 'Michaelsville Rd'
OR 'Route 22'
OR 'PTA Paved'

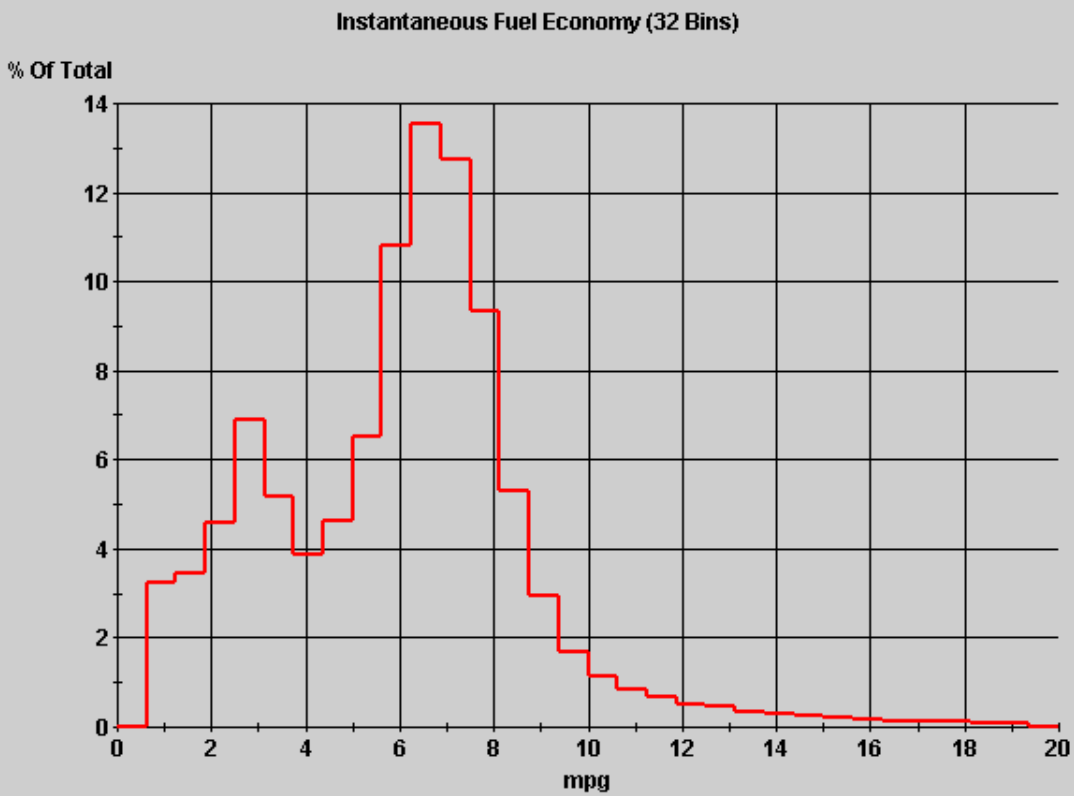
Thumbnails | Histogram | Threshold Crossing | Time In Limits

Histogram

Number OF Bins: 32
Min Scale: 0.0
Max Scale: 20

RMS : 6.615 mpg
Mean : 6.015 mpg
StdDev : 2.754 mpg
Num Samples : 2,909
Num Bins : 32
Max : 18.769 mpg
Min : 0.644 mpg
10% : 2.330 mpg
90% : 8.765 mpg
Num Empty Bins : 2
% Empty Bins : 0.062

Generate



Hold Shift Key Down While Dragging Mouse For Zoom
Right Click For Chart Customization Dialog

Reset Chart | Save As GIF

Adjust Bin Values

VISION
Digital Library

Client Tier
Web Browser

Client

Native Windows

Internet / Intranet/Extranet

Application Tier
Enterprise Application Server

Web Server
Application Server
APIs

External Web Servers

Full-Text Index

Data Tier
Repository

CORE *Oracle 7.3*

Photos *.mpg, jpg, .tiff*

Videos *.avi, .mov*

Workload ***.dbf***

Test Documents *.doc, .xls, .pdf*

Live Test Monitoring *(ADMAS)*

RAM/ILS *Image 3000*

VIRTUAL TEST DATA *Oracle 8.0*

Institutional Data Servers *MS SQL Server*

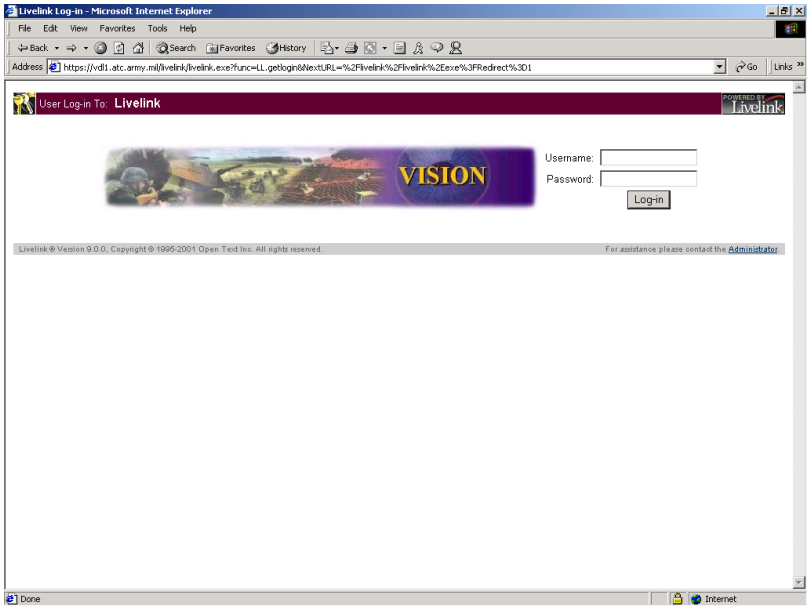
Complete Data Servers ***(.uff, .blb, sdf)***

Engr Unit DB *Oracle 8.0*

VPG Terrain Databases

VISION Digital Library

- Incorporates COTS knowledge management products – Livelink (Opentext)
- Accessed through the use of a web browser
- Application is extendable



Digital Library/ Data Management Status

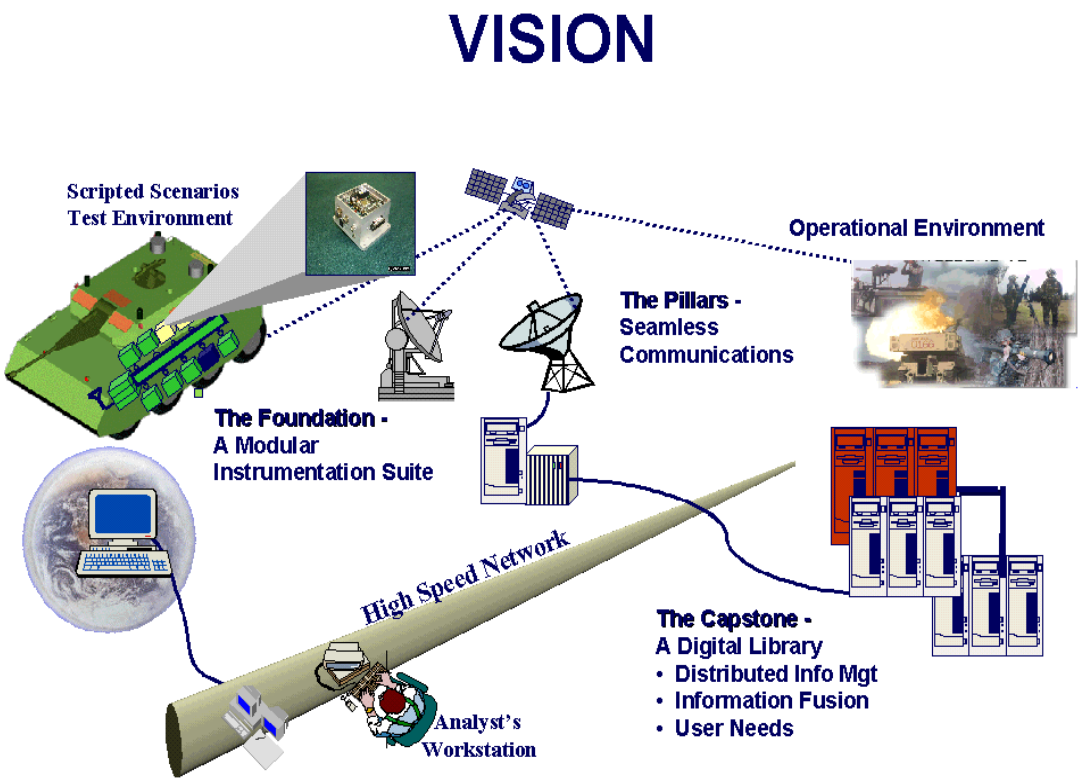
- Digital Library
  - 2,400 Users
    - Expect 5,000 within a year
  - 500 DTC projects
    - Expect all DTC Major Acquisition and 80% of other projects within a year
  - Project Workspace for all AEC ASTs
  - Project Workspace for OTC, DTC, ATEC, Air Force and Navy
  - 250,000 digital objects

- Engineering Performance Data Mart
  - 208,000 BLObs
  - 198 gigabytes
  - Expected to grow an order of magnitude in the next two years

Embedded Instrumentation Recommendations

Good judgment comes from experience, and a lot of that comes from bad judgment.

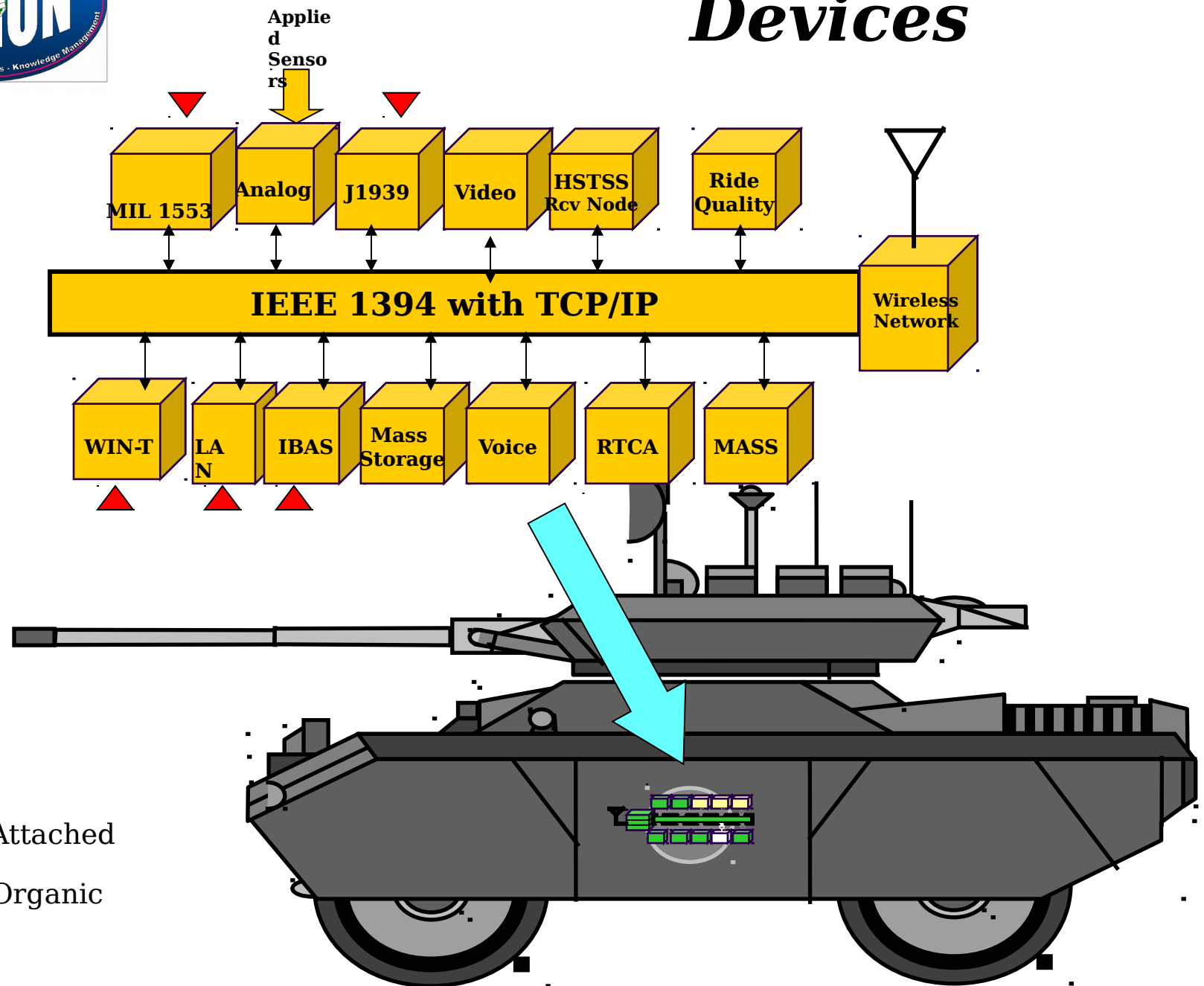
Will Rogers



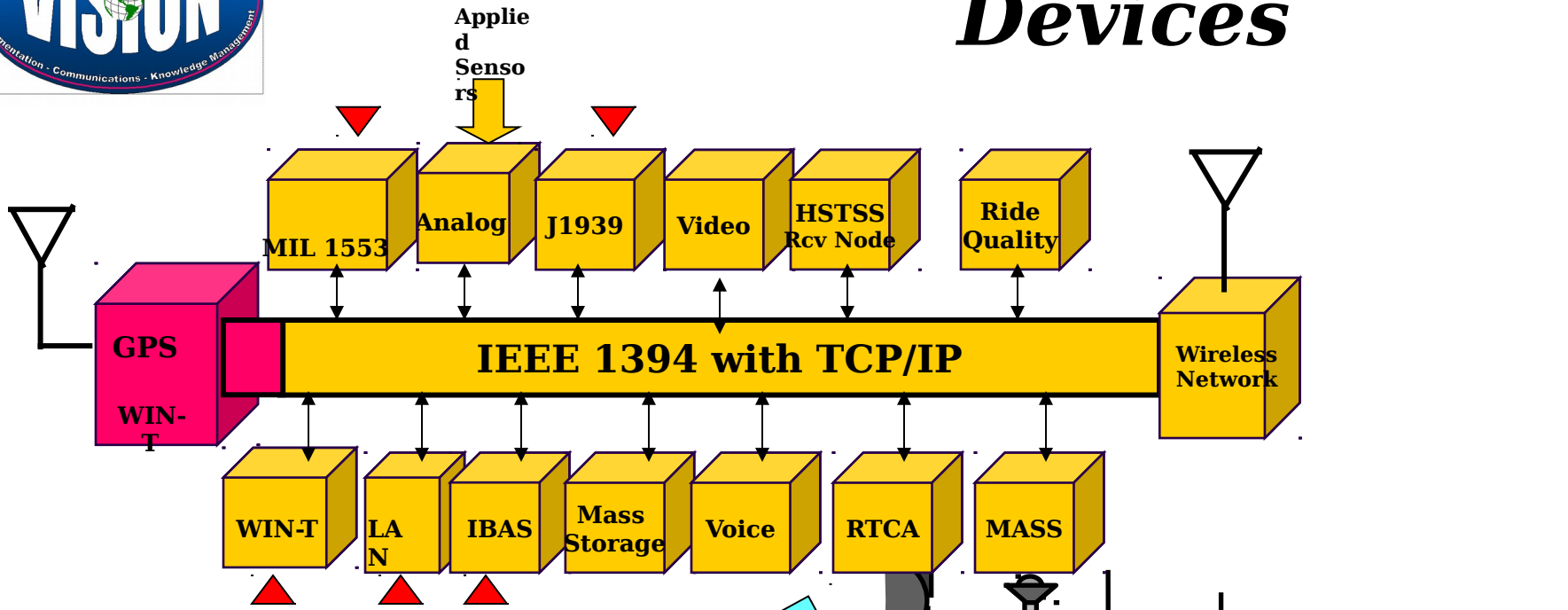
Instrumentation Recommendations

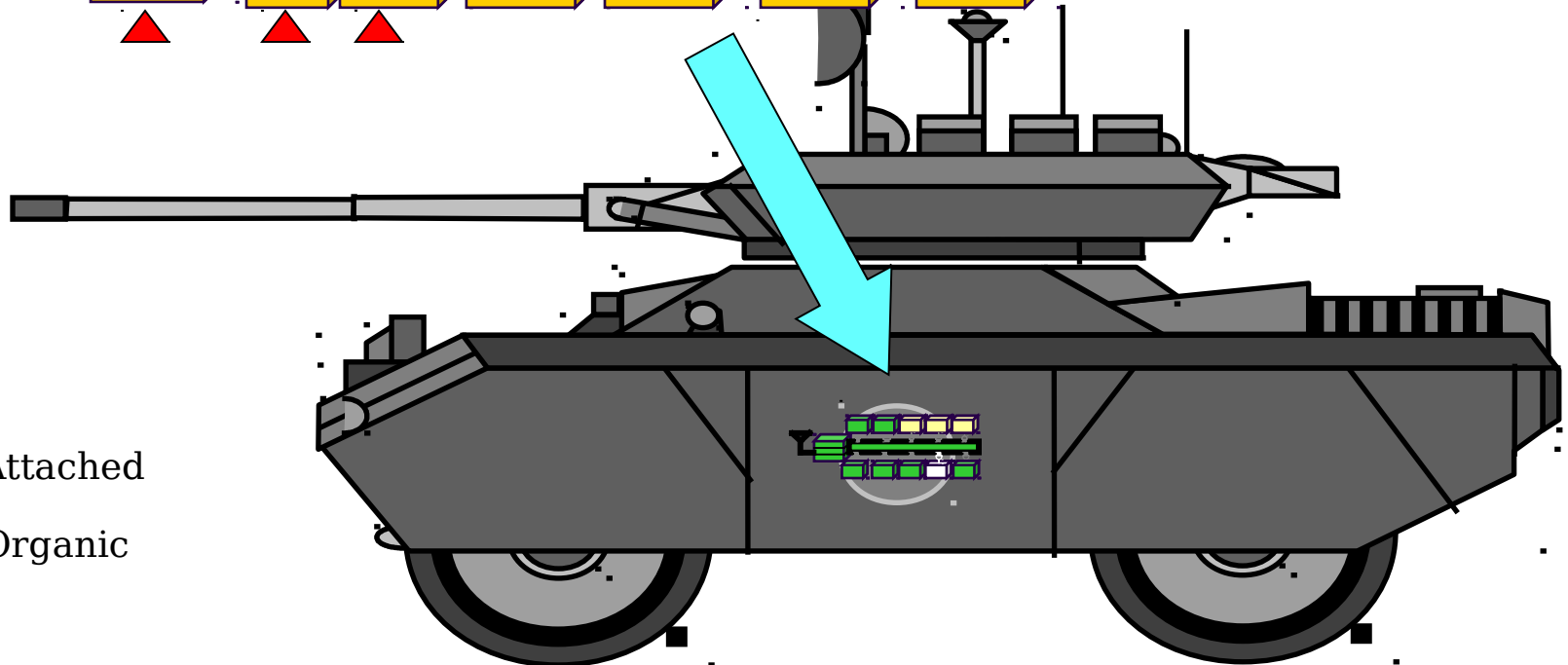
- Consider the information life cycle up front
- Define the architectures first
- Include flexible configuration capabilities
- Include pre-programmed algorithms or scripting capabilities
- Do not attempt to embed everything
- Exploit the synergies with embedded diagnostics and embedded training

Instrumentation *Devices*



Instrumentation *Devices*

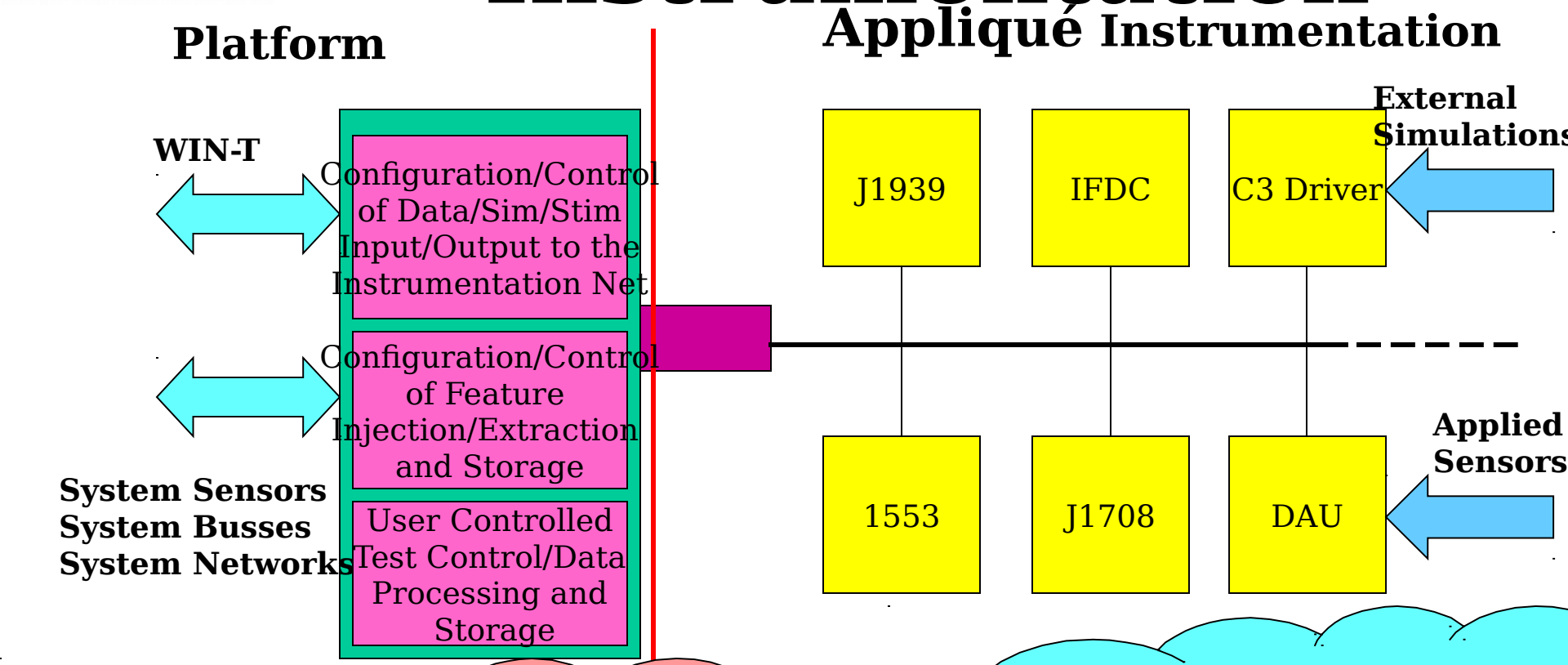




Attached

Organic

Embedded Instrumentation



Embedded instrumentation can be implemented as hardware and software, but the most desirable solution is a software layer in a hardware set devoted to test, training, and

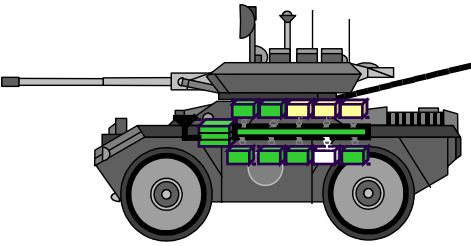
Standards for networked appliqué (physical media, transfer protocol, messages. Commands, …) must be adopted to achieve interoperability

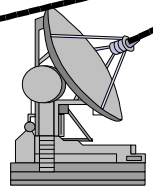
Single Information Stream From Concept to Combat

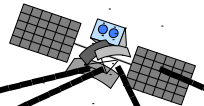
VISION

Begin with the End in Mind

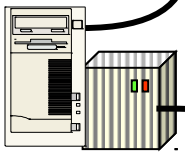
Scripted Scenarios
Test Environment

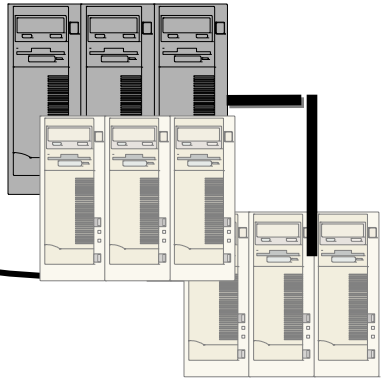






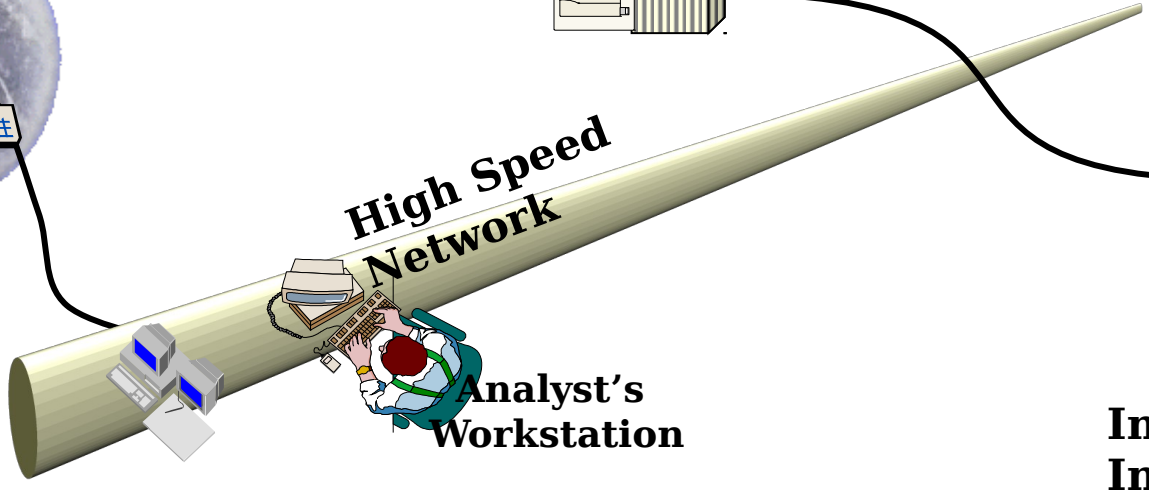
Operational Environment





Internet

High Speed Network



Analyst's Workstation

Integrated Information Systems